STORMAVIATION

Airbus A319/A320/A321 (IAE PW1100G & CFM LEAP-1A) - "NEO"

TECHNICAL TRAINING MANUAL

MECHANICAL & AVIONICS COURSE - T1+T2 (Level 1, 2 & 3)

IAE PW1100G/CFM LEAP-1 ATA 36, Pneumatics Differences

A320NEO-B12-0009.2, Revision 7 Tuesday, 03 September 2019

Airbus A319/A320/A321 (IAE PW1100G & CFM LEAP-1A)

Part-66, Appendix III, Level 3 Training

These notes have been prepared by the Storm Aviation Training Centre to provide a source of reference during your period of training.

They will be useful to you during your training, but I must emphasise that the appropriate Approved Technical Publications (ATPs) must always be used when you are actually working on the aircraft.

We always aim to ensure that these documents are as accurate as possible, however if you notice any items which require amending, please inform the Training Manager or Instructor so that any amendments may be incorporated before the next course.

I trust your course with us will be informative and enjoyable.

Ben Greenaway, Training Manager, UK.147.0057

Note to Instructors: Only the sections applicable to the course being delivered should be taught.

Revision Summary

Part-66, App III Level	Revision and Date	Summary of Revision
3	R1, 01 Feb 2017	Initial Issue in new format.
3	R2, 19 Apr 2017	Additional LEAP-1A information added.
3	R3, Monday, 22 May 2017	Pneumatics updated.
3	R4, Thursday, 17 August 2017	Bleed duct diagram clarified. BMC CH B EPF clarified.
3	R5, Monday, 01 January 2018	Minor grammatical mistakes corrected. Repeated Level 1 information removed.
3	R6, Monday, 18 June 2018	General corrections. Level 1 diagram enhanced.
3	R7, Tuesday, 03 September 2019	General corrections. Diagrams clarified.

Table of Contents

INTENTIONALLY LEFT BLANK

36 PNEUMATIC SYSTEM INTRODUCTION NEO - Level 1

OVERVIEW

The neo introduces an electro pneumatically controlled EBAS system and changes to the pneumatic bleed detection system.

The Airbus Single Aisle family pneumatic system supplies High Pressure (HP) air for:

- Air conditioning,
- Wing ice protection,
- Water Tank pressurization,
- Hydraulic reservoir pressurization,
- Engine starting,
- Fuel tank Inerting system.

High Pressure air can be supplied from three sources:

- The Engine Bleed system,
- The APU,
- A HP Ground Air source.

The pneumatic system operates electro-pneumatically and is controlled and monitored by 2 Bleed Monitoring Computers (BMC 1& 2).

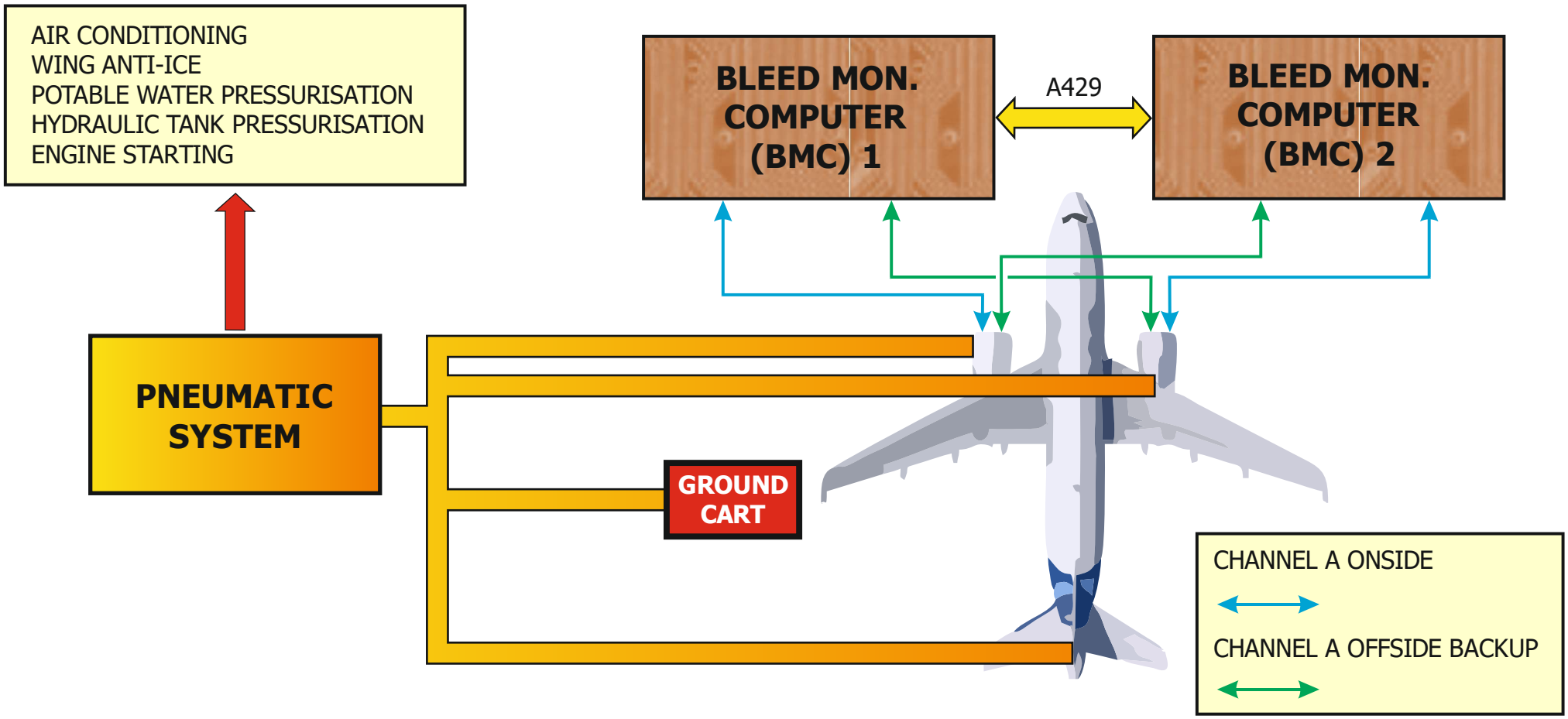
The BMCs are new part numbers compared to ceo aircraft.

There is one BMC for each engine bleed system.

Both BMCs exchange data via A429 databuses.

In this neo configuration, one BMC can control & monitor both sides when the other BMC fails. The BMC communicate via A429 databuses.

SYSTEM INTRODUCTION - NEO



SYSTEM INTRODUCTION (continued)

ENGINE BLEED

The Engine Bleed Air is pressure and temperature regulated before it supplies the pneumatic system.

- **PW1100G**: Air is bled from an Intermediate Pressure (IP) stage (HP3) or the HP8 stage with the High Pressure Valve (HPV) which is used for the pneumatic regulation.
- **LEAP-1A**: Air is bled from an Intermediate Pressure (IP) stage (HP4) or the HP10 stage with the High Pressure Valve (HPV) which is used for the pneumatic regulation.

The IP check valve gives protection to the IP stage from reverse flow when the HP valve is open.

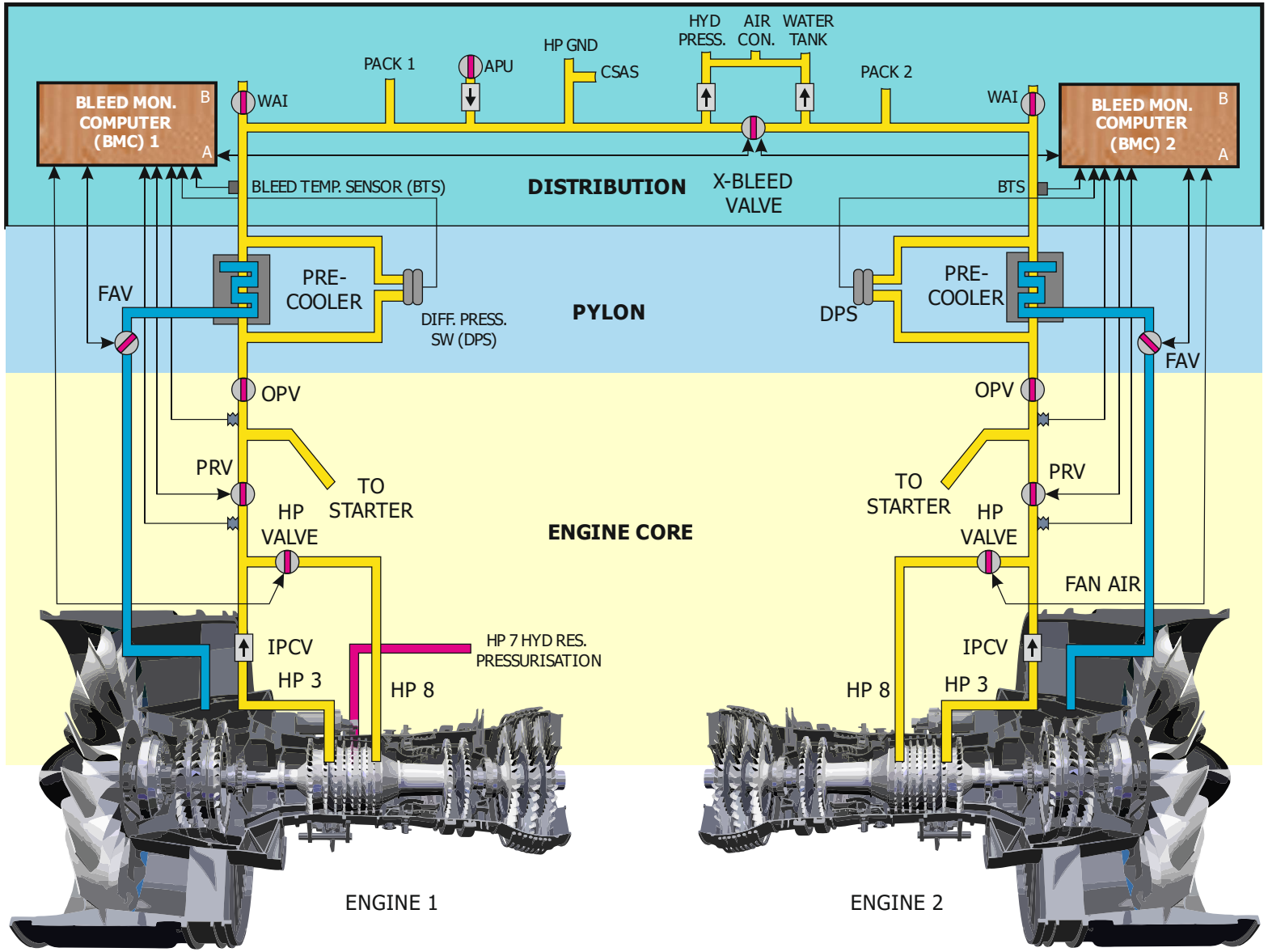
Note: The Engine Bleed Air System (EBAS) uses electro-pneumatic valves.

The HP bleed is only used when the engines are at low power and for engine efficiency the High Pressure Valve (HPV) is kept closed during cruise. The Pressure Regulating Valve (PRV) regulates the bleed air pressure. The PRV is used as a protective shut off valve when the parameters are abnormal. In case of EBAS electrical failure, the PRV operates in back-up pneumatic mode.

An Overpressure Valve (OPV) is installed downstream of the bleed valve to give protection to the system if an overpressure condition occurs. On this PW Engine the OPV is installed in the engine core. The Fan Air Valve (FAV) modulates Fan discharge air through an air-to-air heat exchanger called "Precooler" to reduce the Bleed temperature. BMCs are Dual Channel computers. Each BMC channel A is a full digital channel embedding all the control and monitoring functions. Channel B is a hardware part and back-up channel able to detect system overtemperature.

For the monitoring, the BMCs read pressure transducers (upstream / downstream of the PRV), Precooler Differential Pressure and downstream temperature with the Bleed Temperature Sensor (BTS).

SYSTEM INTRODUCTION - ENGINE BLEED & APU BLEED/EXTERNAL AIR - PW1100G shown, LEAP-1A Similar



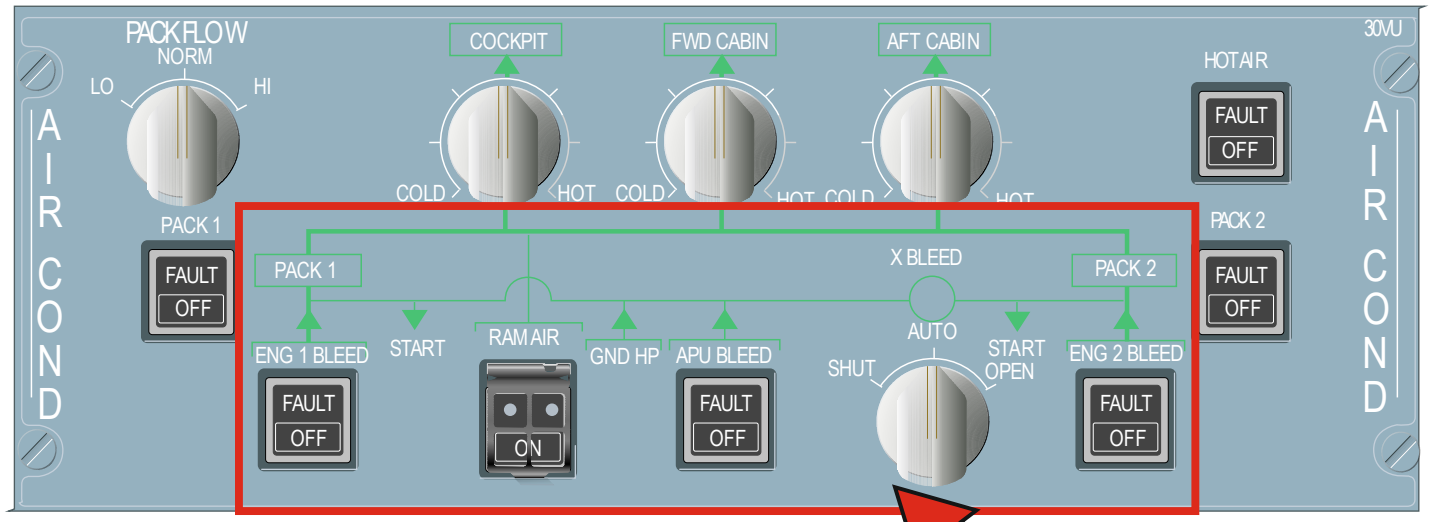
CONTROL & INDICATING

CONTROL PANEL

Controls for the pneumatic system are part of the AIR COND panel and are operated from the overhead panel.

These are the same for the ceo A320 fleet.

CONTROL & INDICATING - CONTROL PANEL (A319/A320 Shown – A321 Similar)



CONTROL & INDICATING (continued)

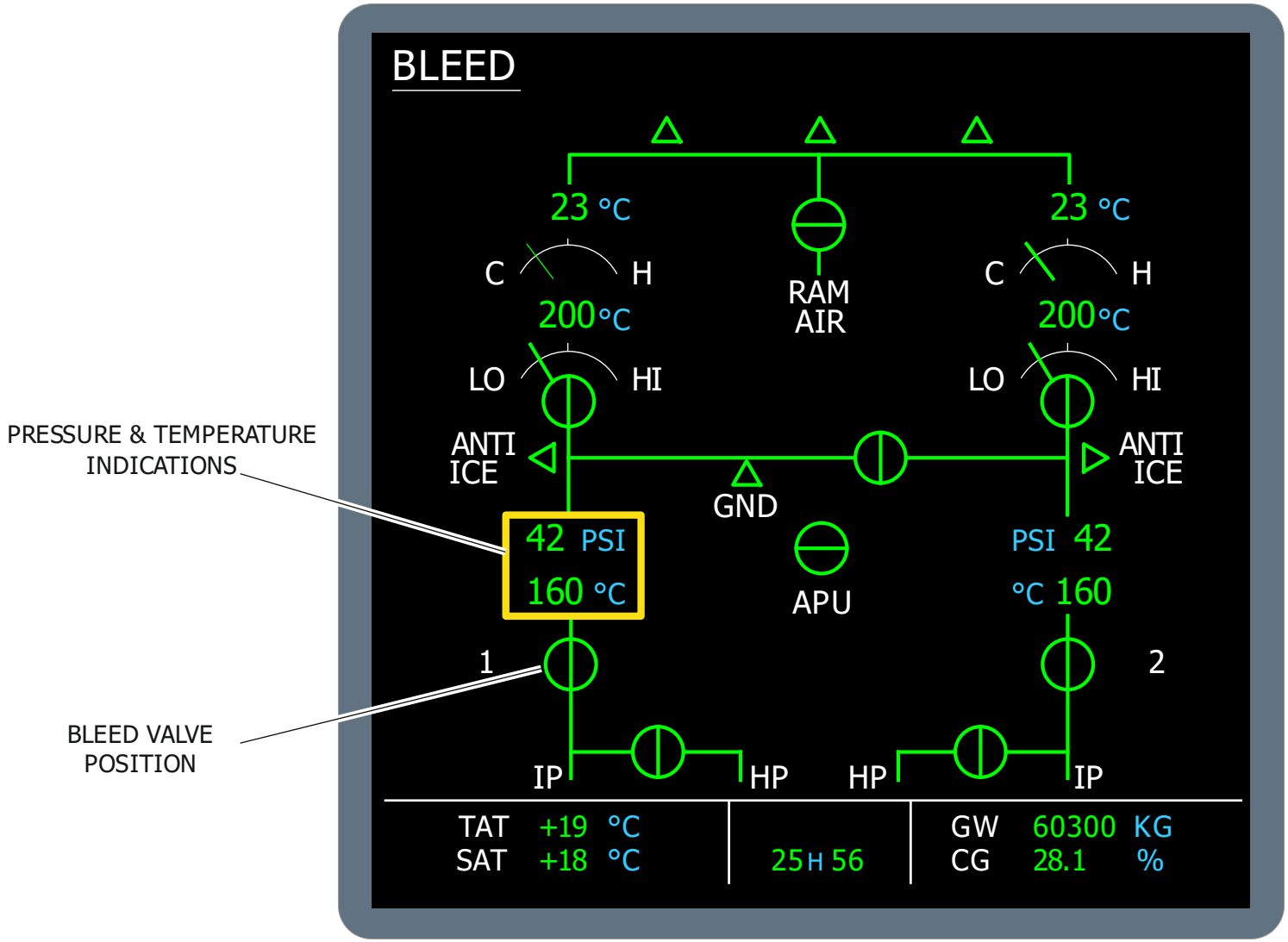
ECAM INDICATION

The pneumatic system indications are displayed on the lower part of the ECAM BLEED page:

HPV, PRV positions with delivered bleed pressure and temperature, APU bleed and crossbleed status.

These are the same for the ceo A320 fleet but values may be slightly different for each engine type.

CONTROL & INDICATING - ECAM INDICATION



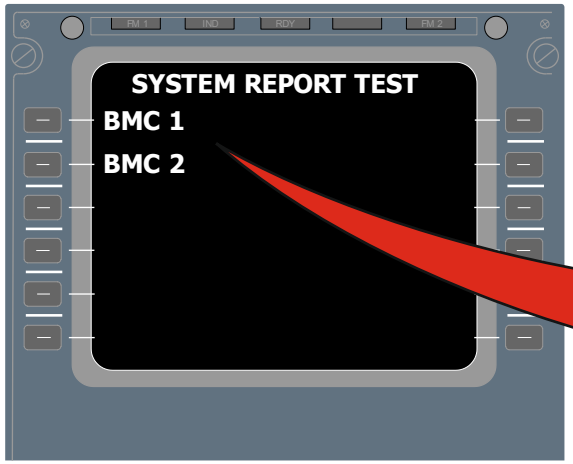
ECAM SD

MAINTENANCE/TEST FACILITIES

Using the Multipurpose Control and Display Unit (MCDU), you can have access to the Centralized Fault Display System (CFDS) fault messages of the PNEUMATIC system. BMC1 and BMC2 Built-In Test Equipment (BITE) is standard type 1.

These are the same for the ceo A320 fleet.

MAINTENANCE/TEST FACILITIES



MCDU

BLEED MON. COMPUTER (BMC) 1

BLEED MON. COMPUTER (BMC) 2

CENTRALISED FAULT DISPLAY INTERFACE UNIT

COMPONENT LOCATION (NEO) - Level 2

The primary components of the pneumatic system are installed on the right hand side of the engine and in the pylon.

PRESSURE REGULATION COMPONENTS

The pressure regulation components on the engines are the:

- Engine HPV,
- Engine BLEED PRV,
- OPV,
- Bleed Monitoring Pressure Sensor (BMPS),
- Bleed Pressure Sensor (BPS),
- Differential Pressure Sensor (DPS).

To get access, open the right fan cowl and thrust reverser cowl.

OTHER COMPONENTS

Note: These are the same as for the CEO aircraft.

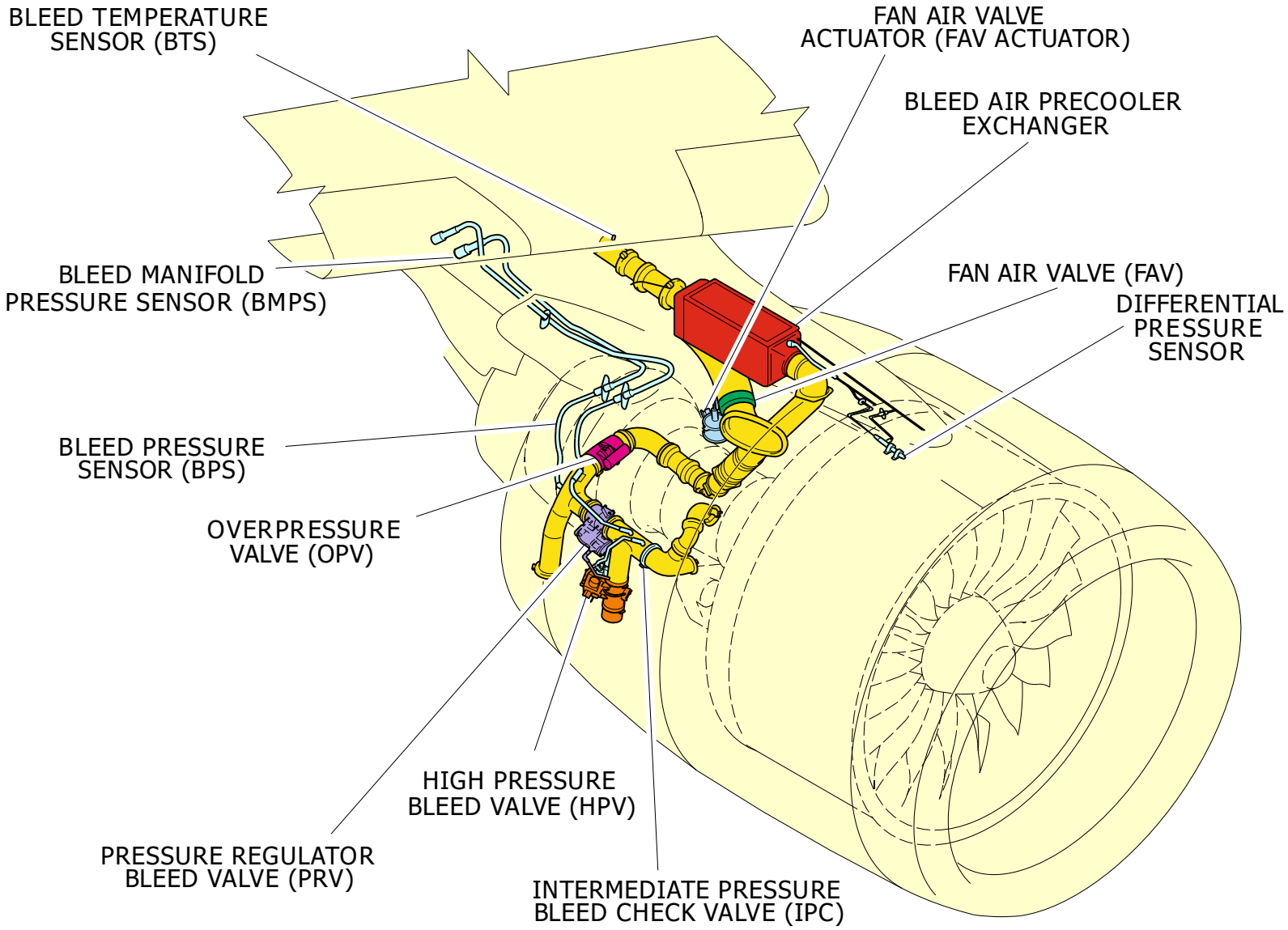
The Crossbleed valve is in the forward section of the lower fuselage belly fairing area.

The access to the HP ground connector is through a small access door in the lower fuselage belly fairing.

The APU bleed valve is on the APU.

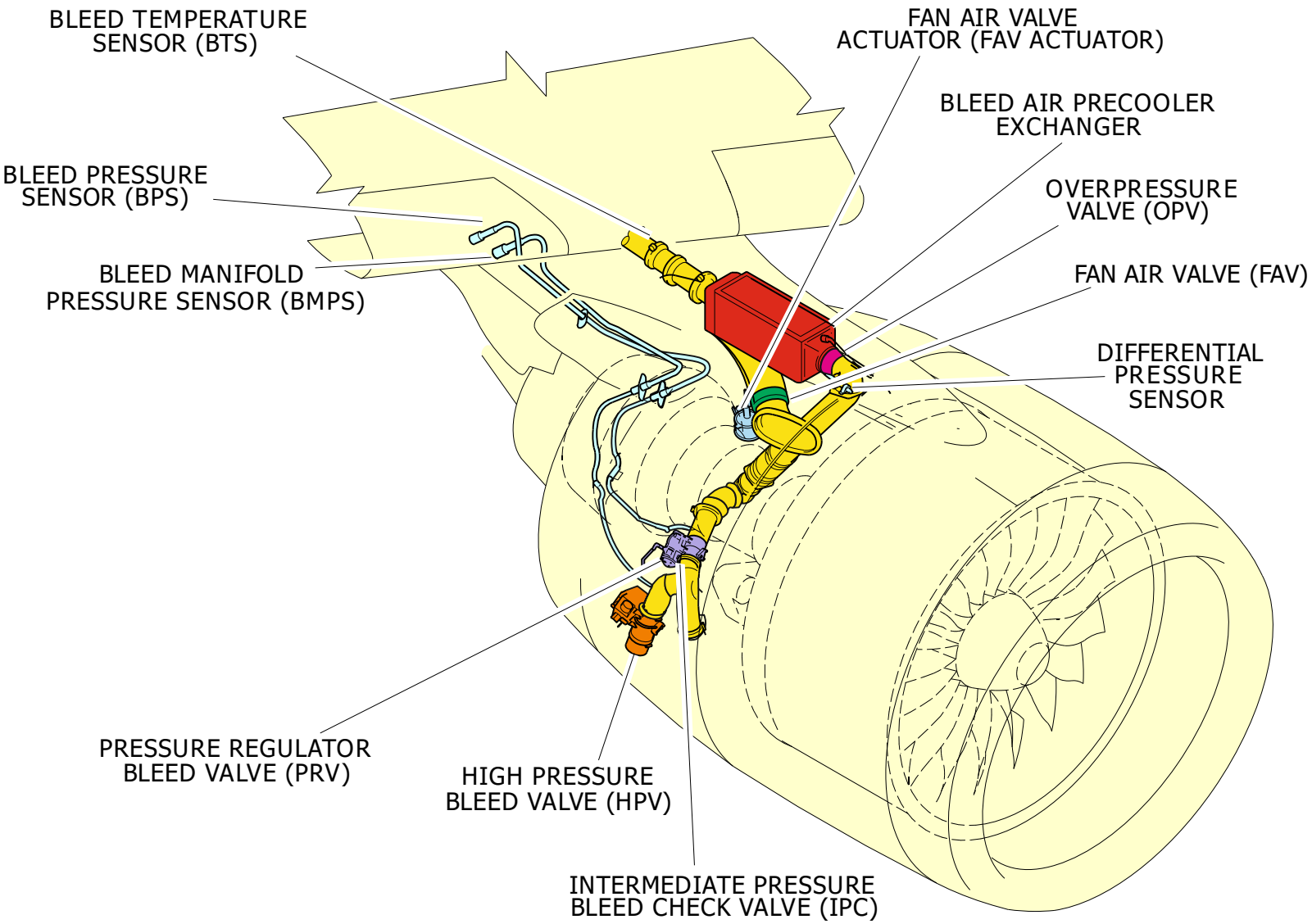
The APU supply duct is installed along the left hand side of the fuselage to the wheel well area and is connected to the crossbleed duct in the forward belly fairing area.

ENGINE PNEUMATIC COMPONENTS (PW1100G) - LOCATION



INTENTIONALLY LEFT BLANK

ENGINE PNEUMATIC COMPONENTS (LEAP-1A) - LOCATION



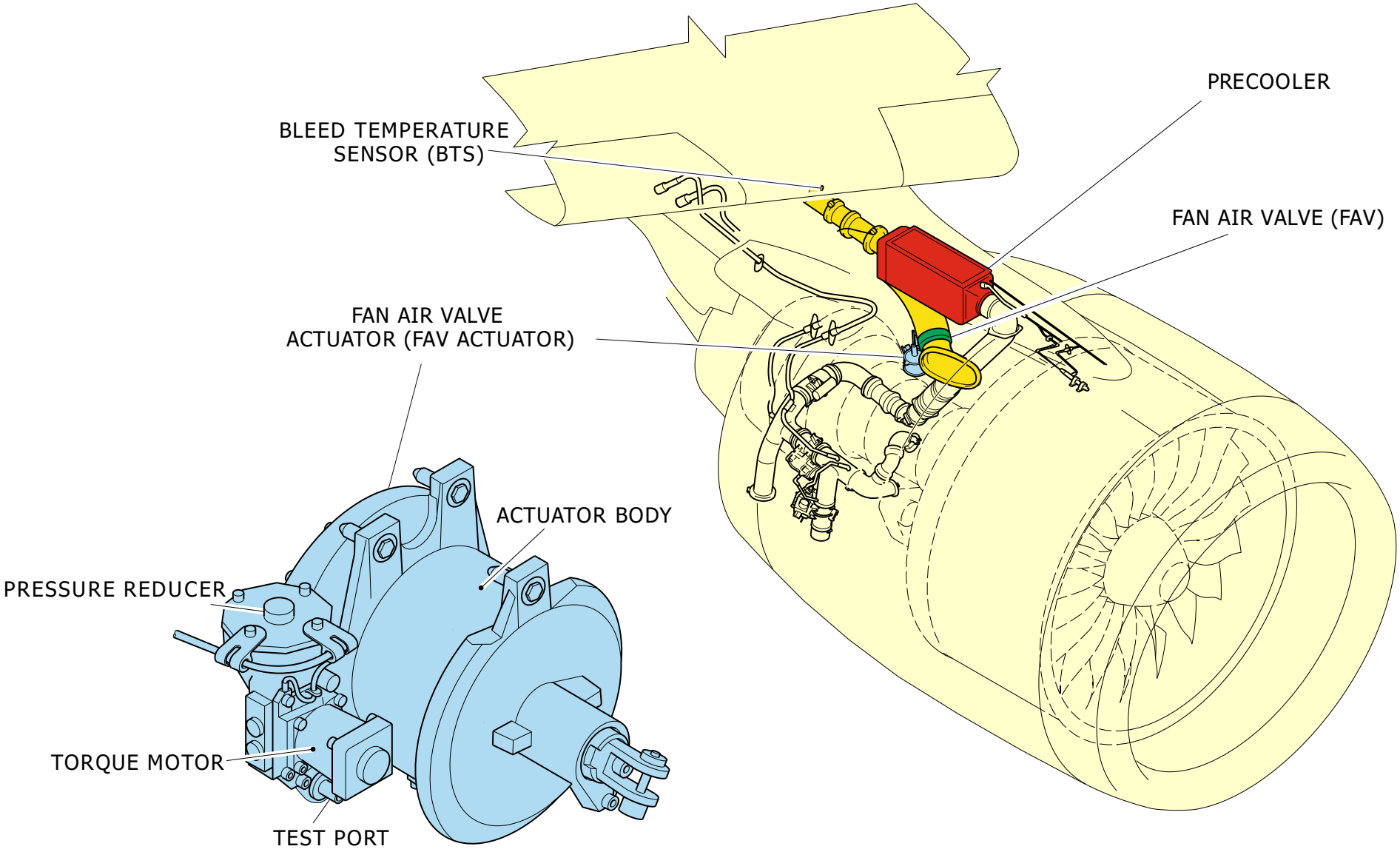
COMPONENT LOCATION (continued)

TEMPERATURE REGULATION COMPONENTS (PW1100G & LEAP-1A)

The temperature regulation components are in the pylons:

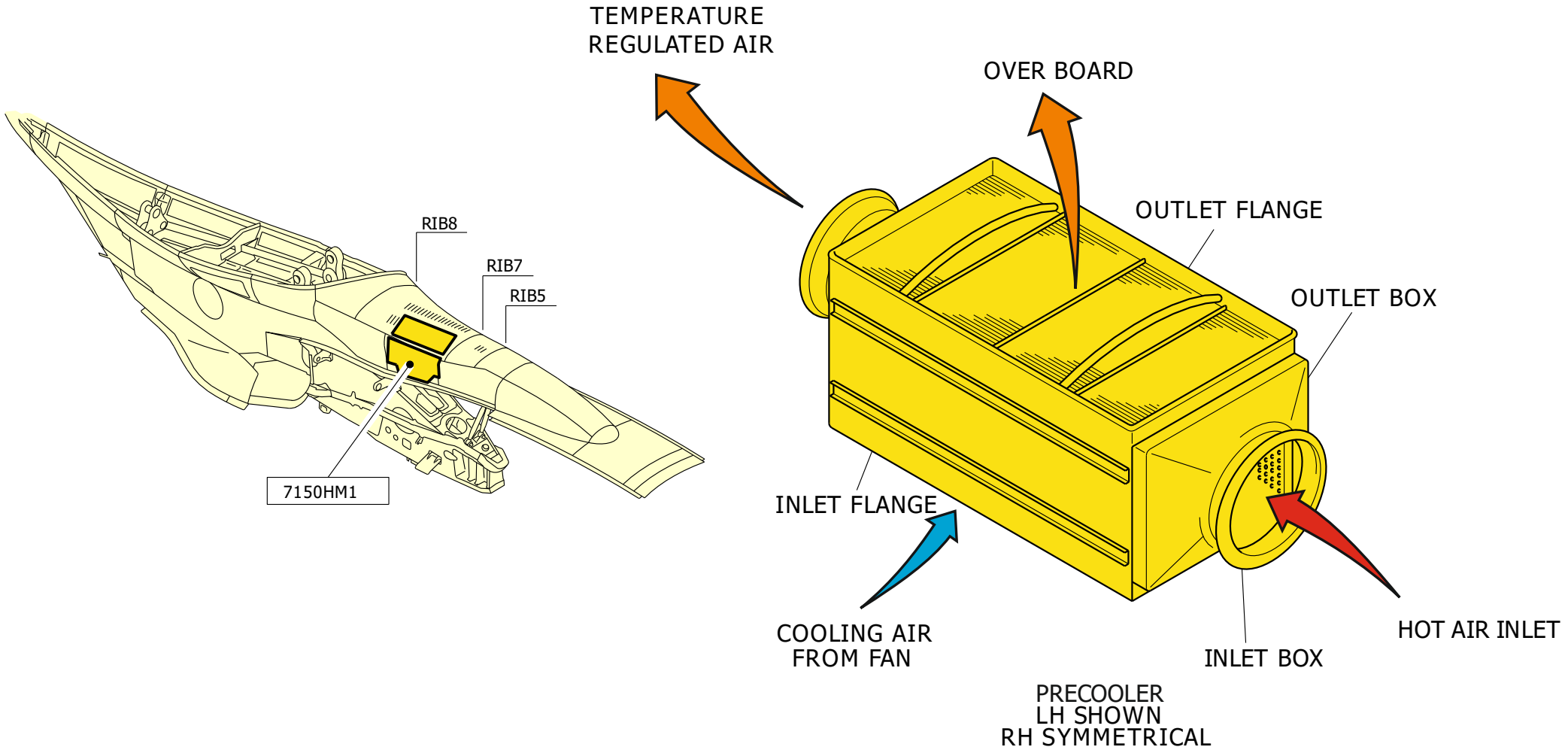
- The FAV
- The Precooler
- The Bleed Temperature Sensor (BTS)

TEMPERATURE REGULATING COMPONENTS (PW1100G & LEAP-1A) - LOCATION - 1



INTENTIONALLY LEFT BLANK

TEMPERATURE REGULATING COMPONENTS (PW1100G & LEAP-1A) - LOCATION - 2



ENGINE BLEED SYSTEM DESCRIPTION (PW1100G)

PNEUMATIC SYSTEM B2 SCOPE - Level 3

Note: MODULE TAGGED B2 SCOPE. BE AWARE THAT ONLY AVIONICS/ELECTRICAL TOPICS SHOULD BE DELIVERED FOR A B2 COURSE.

GENERAL

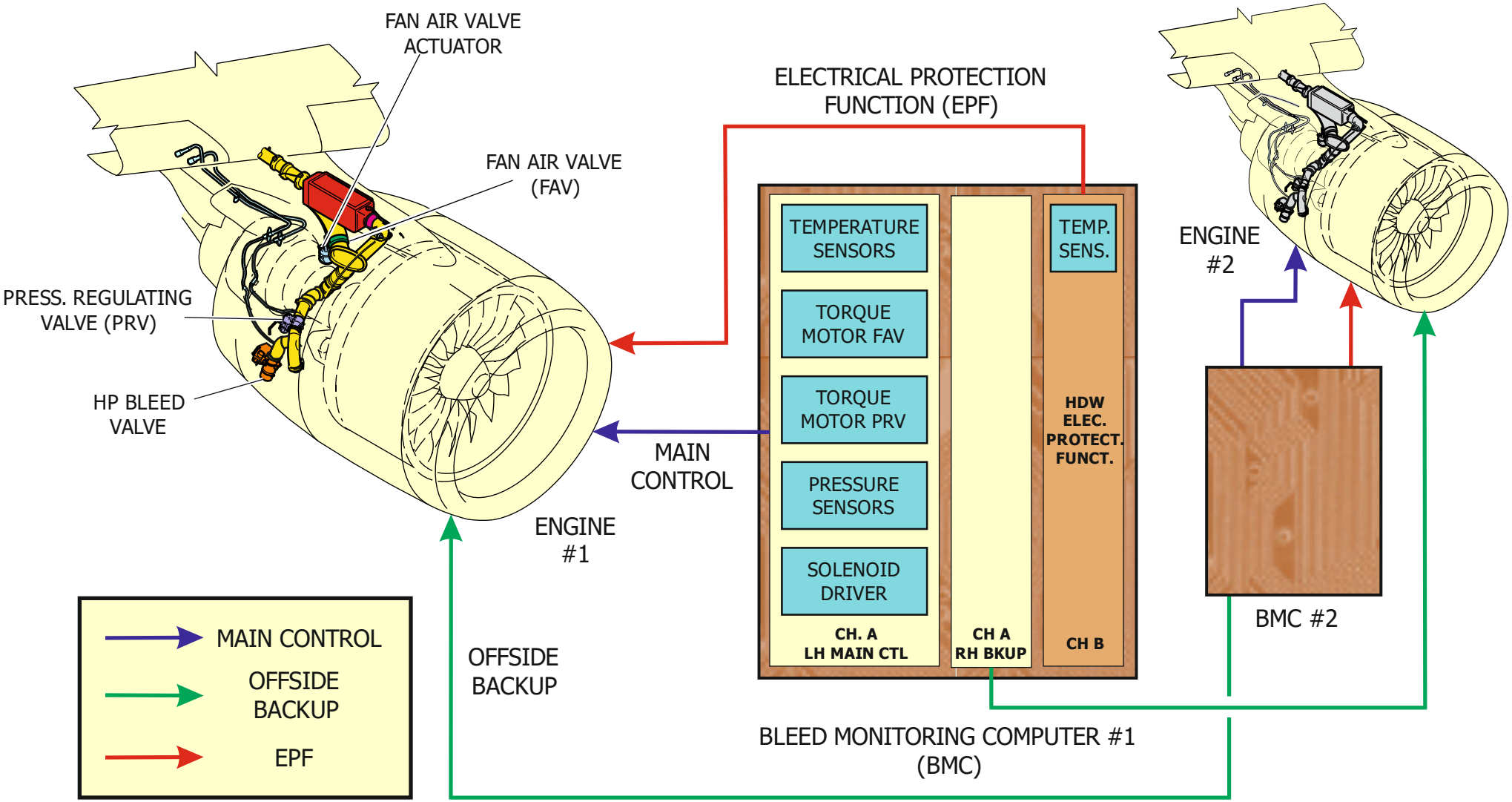
The Engine Bleed Air System (EBAS) supplies pressure and temperature regulated airflow from each engine to the air system users.

During normal operation, each engine bleed system is isolated from adjacent system by the Crossbleed valve; except during 2nd engine starting using air bled from 1st started engine, Crossbleed valve opened or under APU Bleed. The pressure regulation system is controlled and monitored by two Bleed Monitoring Computers (BMCs).

As compared to A320 ceo, the neo engine has higher bleed air temperatures during high Pressure (HP) operation, lower air pressure during Intermediate Pressure (IP) operation, lower fan pressures for cooling air flow supply and limited space for installation due to new pylon configuration. To achieve better performance requirements a new electro-pneumatic bleed air system is designed for A320 neo.

The BMCs are located on the 90VU rack.

PNEUMATIC CONTROL SYSTEM - LEAP-1A shown, PW1100G Control Same (Component Location Different)



BLEED MONITORING COMPUTER (BMC)

GENERAL

The BMCs operate differently to the ceo A320 system and are a different part number. There are three main parts:

- Onside channel A control (onside main control)
- Offside channel A control (offside backup)
- Channel B, Electrical Protection Function (EPS) (onside hardware protection)

Channel A

Normally BMC 1 Channel A does all the control and monitoring of the LH EBAS and BMC 2 Channel A the RH EBAS.

Each BMC channel A controls torque-motor and solenoid for the electro-pneumatic valves, monitors sensors. As both BMC interface with, each BMC is capable to control the other side via the Channel A backup.

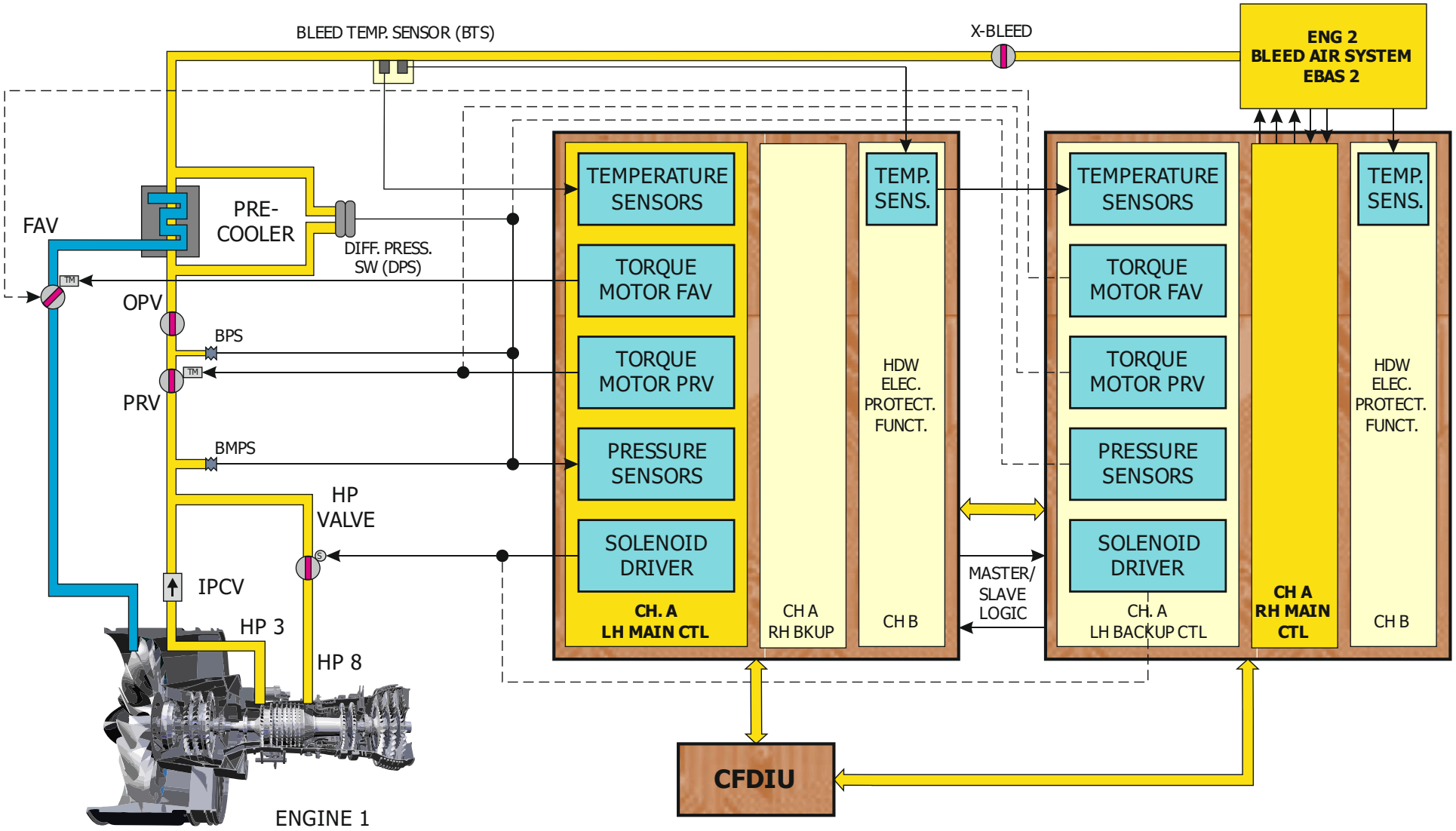
Channel B - Electrical Protection Function (EPF)

Channel B is a fully hardware part able to detect a system over temperature (known as the Electrical Protection Function (EPF)). This detection is fully independent from the software part and closes the PRV.

Channel B is an analogue board embedding full hardware Electrical Protection Functions (EPF). These EPFs are based on a hardware comparator whose output is activated as soon as associated input sensor gets to a critical threshold.

Each BMC reports the failures independently of each other via databus A429 to the CFDS.

BLEED MONITORING COMPUTER - PW1100G shown, LEAP-1A Similar



HIGH PRESSURE COMPRESSOR (HPC)

HP VALVE (HPV)

The engine air bleed pressure is pneumatically regulated by the HP Valve (HPV) when air is supplied by the High Pressure Compressor (HPC) stage or directly by the Pressure Regulating Valve (PRV) when the air is supplied by the Intermediate Pressure (IP) HPC stage.

PW1100G

- Intermediate-pressure service port: IP is defined by HP3.
- High-pressure service port: HP is defined by HP8.

LEAP-1A

- Intermediate-pressure service port: IP is defined by HP4.
- High-pressure service port: HP is defined by HP10.

The HPV lets air to be bled from the engine HP stage at lower power settings. This is a pressure regulating and shut-off valve with a butterfly closure element. It regulates the pressure of the bleed air between 15 and 65 psig. With the Solenoid energized, the minimum upstream muscle pressure needed to operate the valve is 15 psig. When the solenoid is not energized, the HPV is commanded to the full closed position.

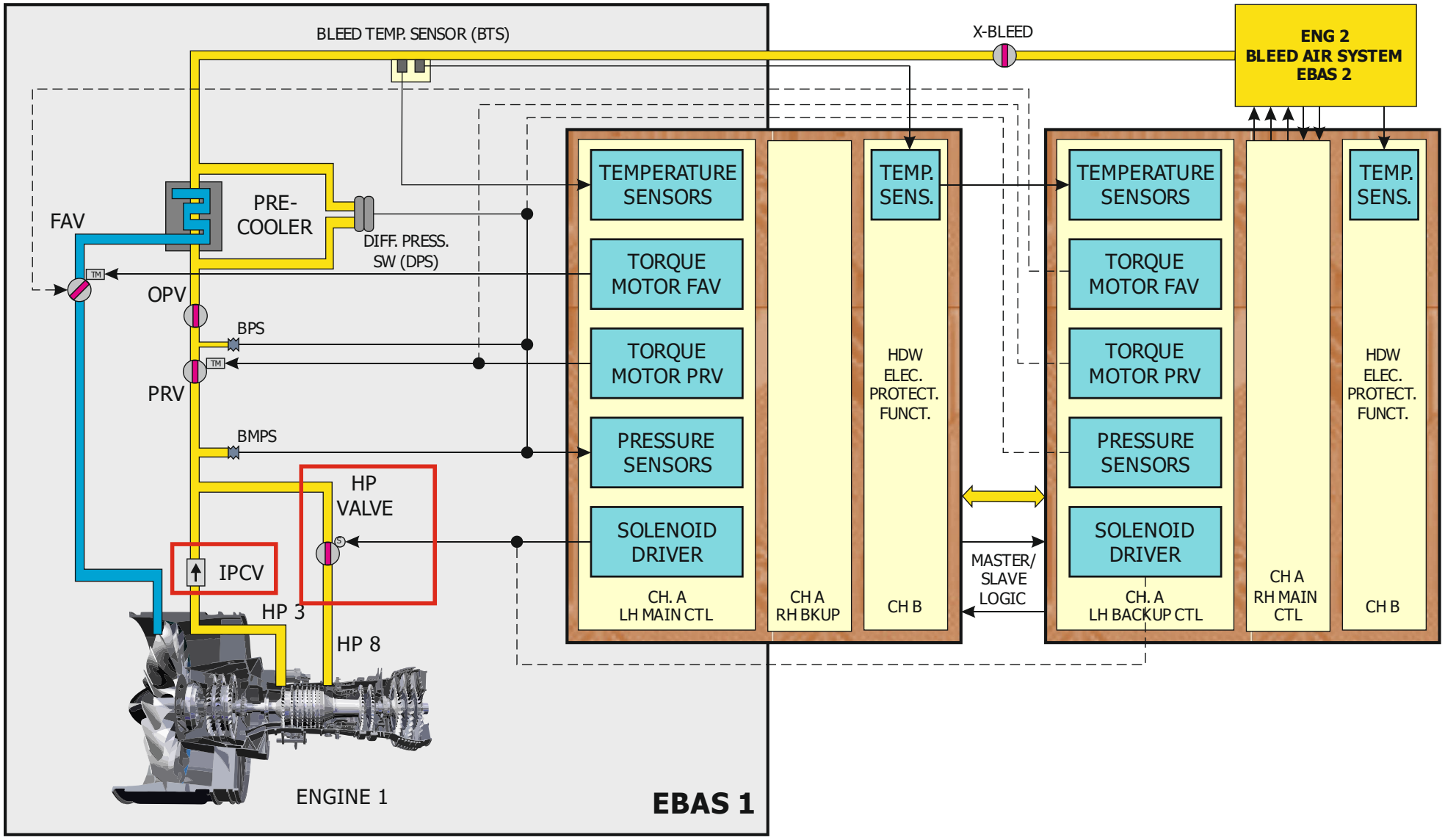
When the solenoid is energized but without pressure in the valve body, the HPV stays closed.

The HPV is forced to close when the PRV is closed. The valve has a manual override and test port for pneumatic test in-situ.

IP CHECK VALVE (IPCV)

An Intermediate Pressure Check Valve (IPCV) lets air to be bled from the engine IP stage. It is closed when air is bled from HP stage. The purpose of this IPCV is to allow the flow from IP stage and avoid the reverse flow from either the HP port or the pneumatic manifold.

HP VALVE (HPV & IP CHECK VALVE IPCV) - PW1100G shown, LEAP-1A Similar



PRESSURE REGULATING VALVE (PRV)

The Pressure Regulating Valve (PRV) is a 4 inch diameter butterfly valve, installed downstream of the IPCV and HPV.

It regulates the pressure of the bleed air at 42 ± 2 psig in normal dual bleed operation (50 ± 2 psig in single bleed operation).

Its setting is modulated by the electric command on the torque-motor. When the torque-motor is de-energized, the PRV is commanded to the full closed position.

When the torque-motor is energized but without pressure, the PRV stays closed.

With the torque-motor energized, the minimum upstream muscle pressure needed to operate the valve is 15 psig.

The PRV operates as a shut off valve when abnormal conditions occur. In case of electrical failure of the EBAS, pressure control is ensured by the PRV in back-up pneumatic control mode.

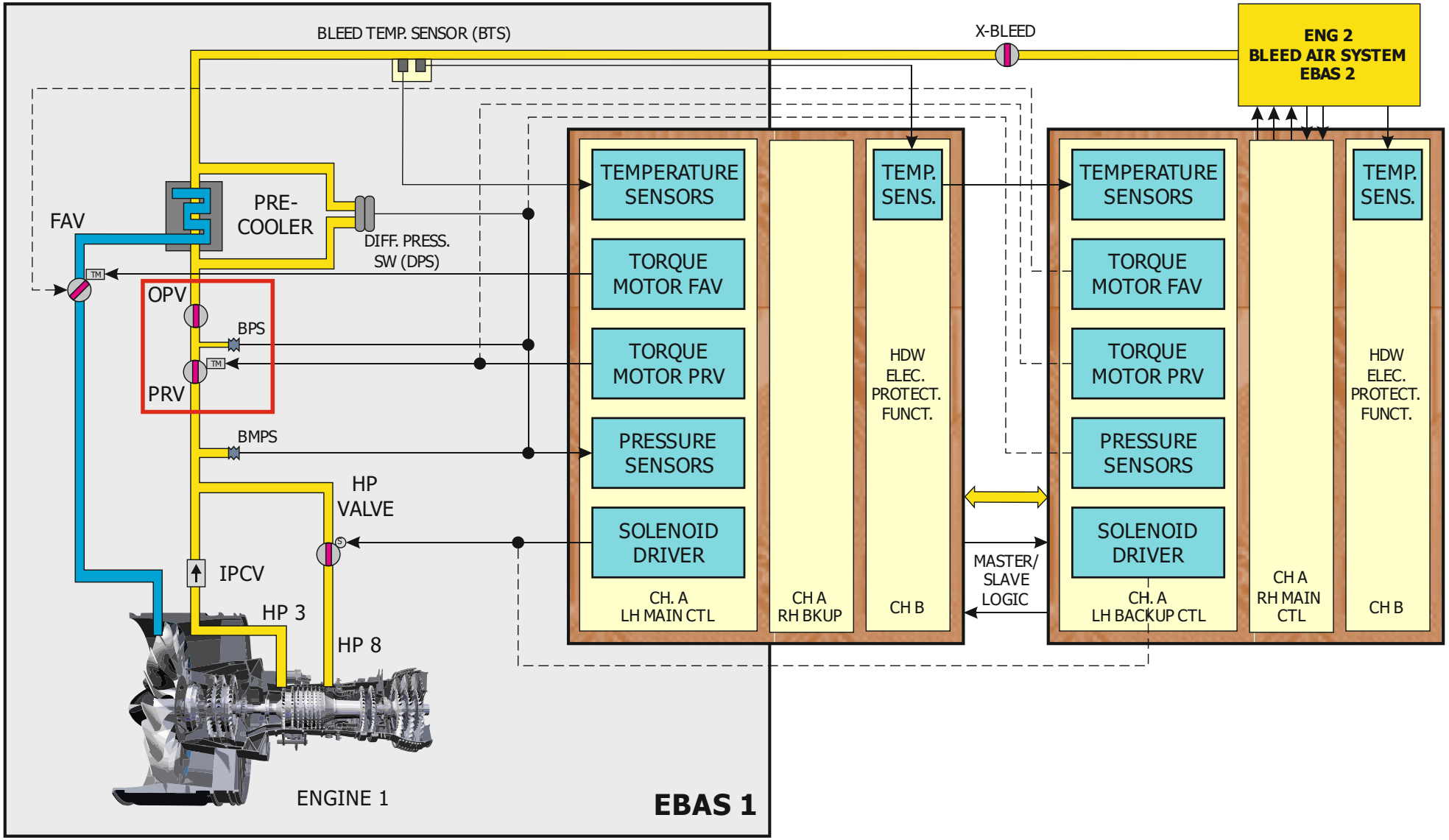
The valve has a manual override and test port for pneumatic test in-situ.

OVERPRESSURE VALVE (OPV)

The Overpressure Valve (OPV) (downstream of the PRV) protects the system against damage if overpressure occurs. It operates pneumatically. The OPV, normally in spring-loaded open position will be fully closed if bleed pressure reaches 90 psig.

- For the PW1100G, this is located at the 1 o'clock position in upper core engine area.
- For the LEAP-1A, this is located within the pipe work/entry to the pre-cooler in the pylon area,

PRESSURE REGULATING VALVE (PRV) & OVERPRESSURE VALVE (OPV) - PW1100G shown, LEAP-1A Similar



PRESSURE SENSORS

BLEED MONITORING PRESSURE SENSOR (BMPS)

The Bleed Monitoring Pressure Sensor (BMPS) is used to perform bleed port switching function. It is also used to estimate the position of the HPV butterfly and to monitor the HPV and the PRV.

This is conventionally referred to as pressure transferred.

BLEED PRESSURE SENSOR (BPS)

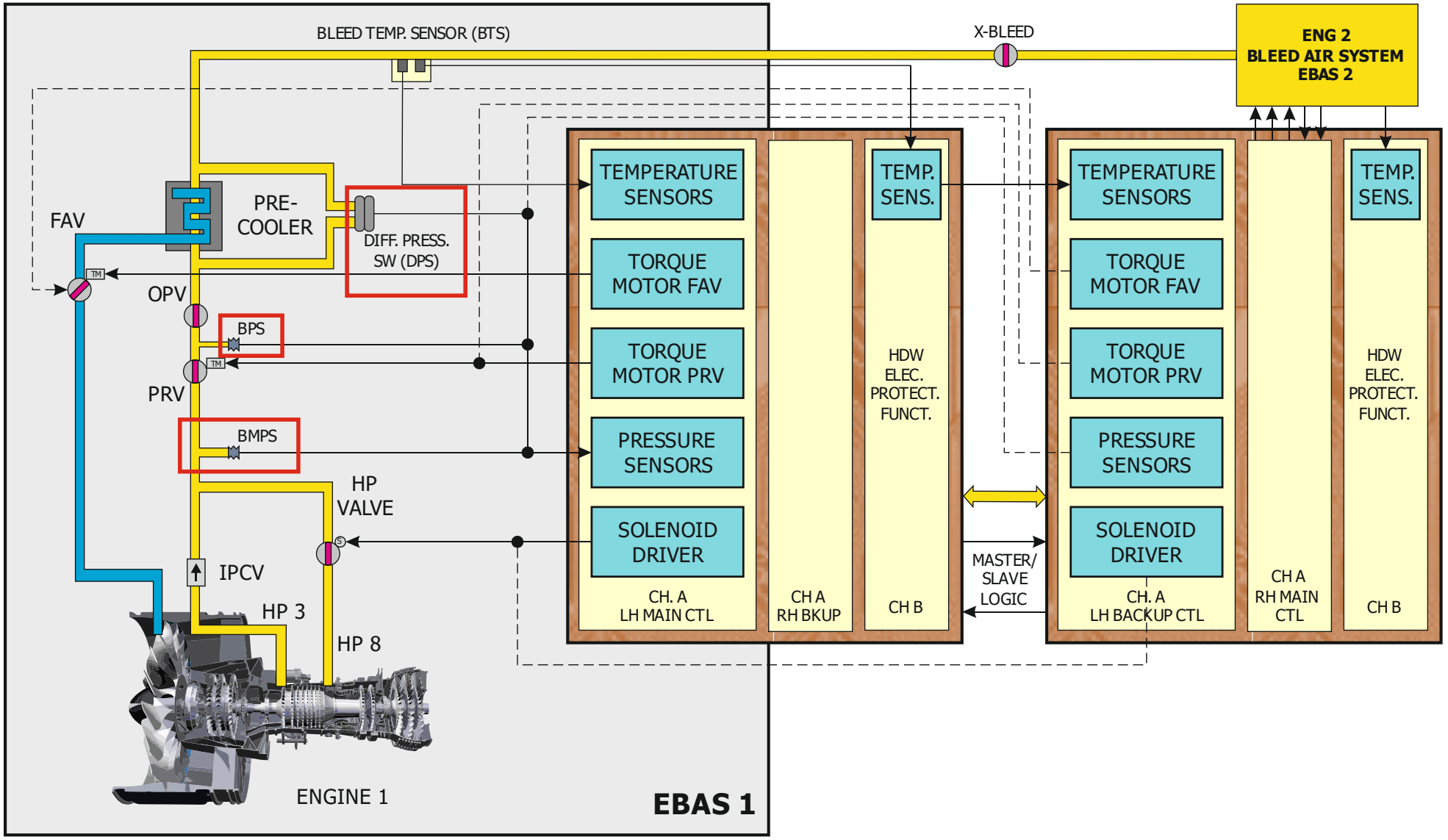
The Bleed Pressure Sensor (BPS) is installed downstream the PRV. It provides to BMC the actual bleed air pressure delivered through the PRV. This sensor is also used by the BMC for system monitoring (overpressure and low pressure alarms) and to monitor the position of the OPV butterfly.

This is conventionally referred to as pressure regulated.

DIFFERENTIAL PRESSURE SENSOR (DPS)

The Differential Pressure Sensor (DPS) ensures the reverse flow protection by sensing the differential pressure between Precooler hot side inlet and outlet. It also provides to the BMC an indication of the PRV and OPV position.

PRESSURE SENSORS - PW1100G shown, LEAP-1A Similar



BLEED TEMPERATURE SENSOR (BTS)

The dual Bleed Temperature Sensor (BTS) installed downstream the Precooler provides to the BMC the actual EBAS temperature.

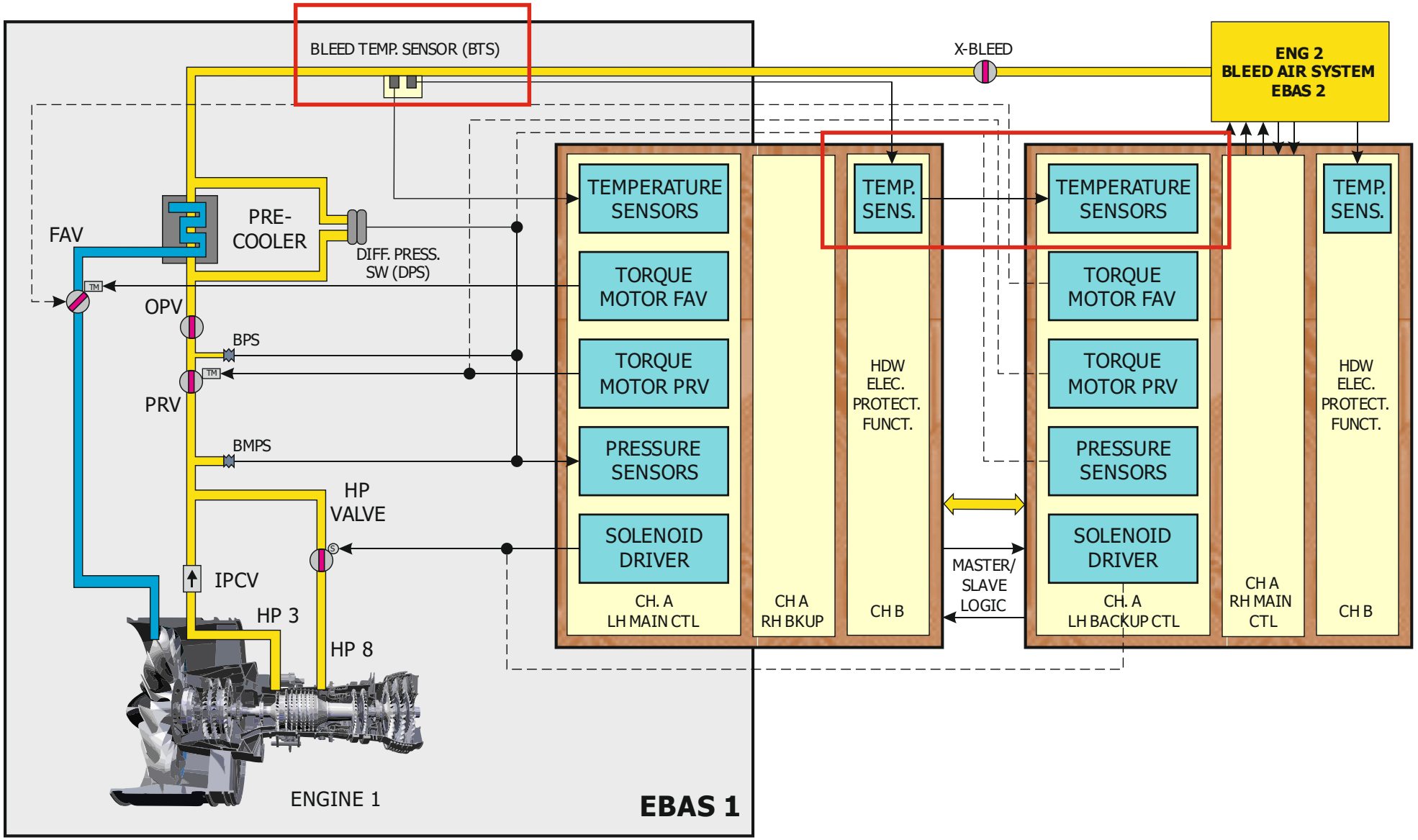
The BMC uses EBAS temperature to position the Fan Air Valve (FAV). The wiring connected to channel A of the BTS is fully segregated from the wiring connected to channel B.

Both BMCs interchange temperature measurements and can carry out both sides temperature regulation.

This dual sensor is also used by the BMCs for system monitoring (over temperature and low temperature alarms).

Note: Channel B of one BMC is connected to Channel A of the other BMC, so that in case of loss of temperature monitoring and control in Channel A of one side, the opposite controller can take over control of the whole EBAS.

BLEED TEMPERATURE SENSOR (BTS) - PW1100G shown, LEAP-1A Similar



TEMPERATURE REGULATION

FAN AIR VALVE (FAV)

The FAV pneumatically regulates the fan airflow to the Precooler for bleed air temperature regulation.

The FAV butterfly valve actuator rod is adjusted by the BMC via a torque motor servo-control depending on BTS input.

The BMC set point is 200°C (392°F) in normal operations and 160°C (320°F) in Climb and Hold with 2 bleeds and Wing Anti-Ice (WAI) off.

With no electrical power and enough muscle pressure, the FAV valve is fully open.

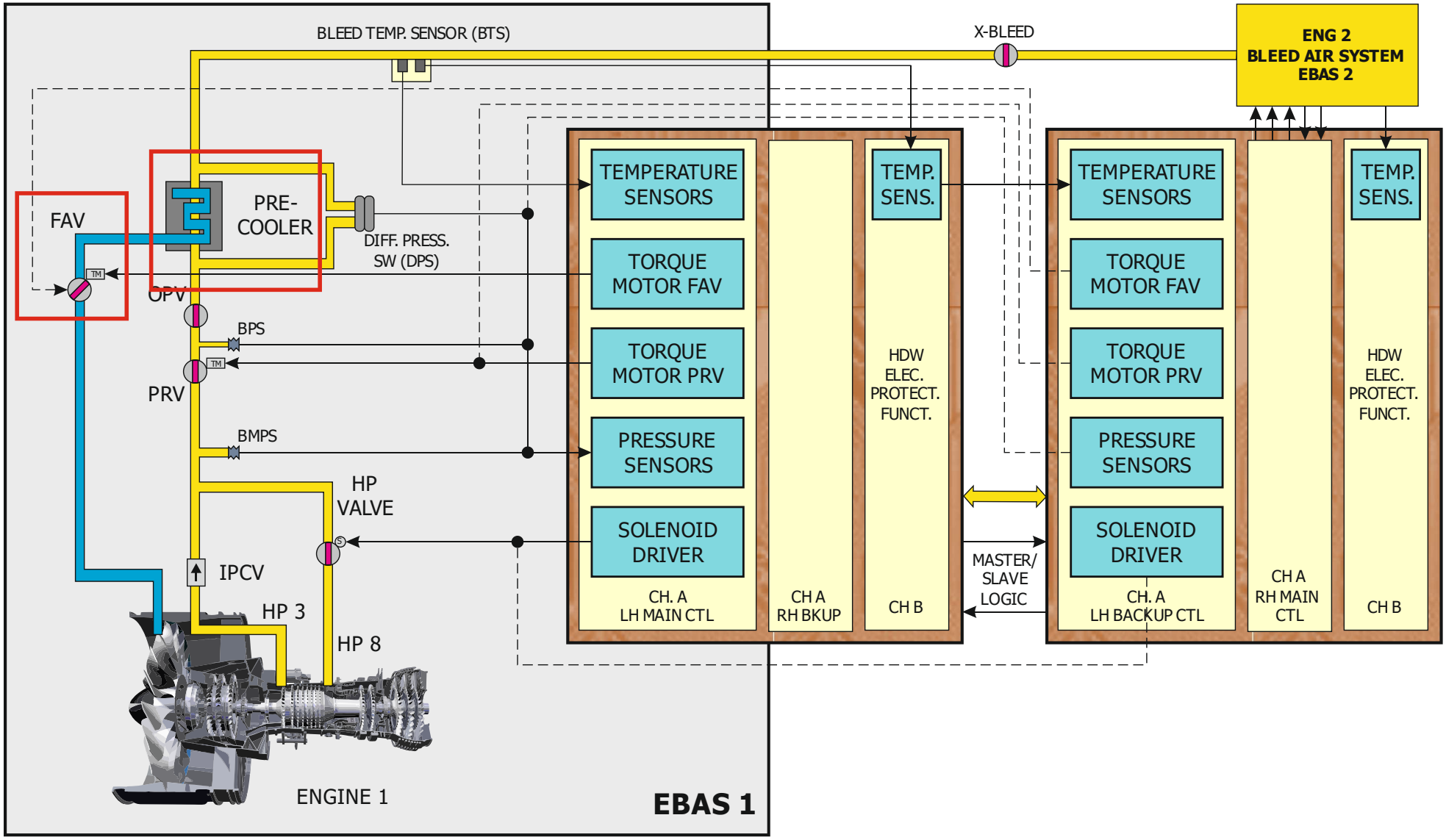
The valve has a test port for pneumatic test in-situ.

PRECOOLER EXCHANGER

The Precooler is a stainless steel and nickel alloy air-to-air heat exchanger.

It cools down the hot air supplied from the engine HP compressor stage by a heat exchange process with cooling flow taken from the engine fan.

TEMPERATURE REGULATION - FAN AIR VALVE (FAV) & PRECOOLER EXCHANGER - PW1100G shown, LEAP-1A Similar



PROTECTION - ISOLATION

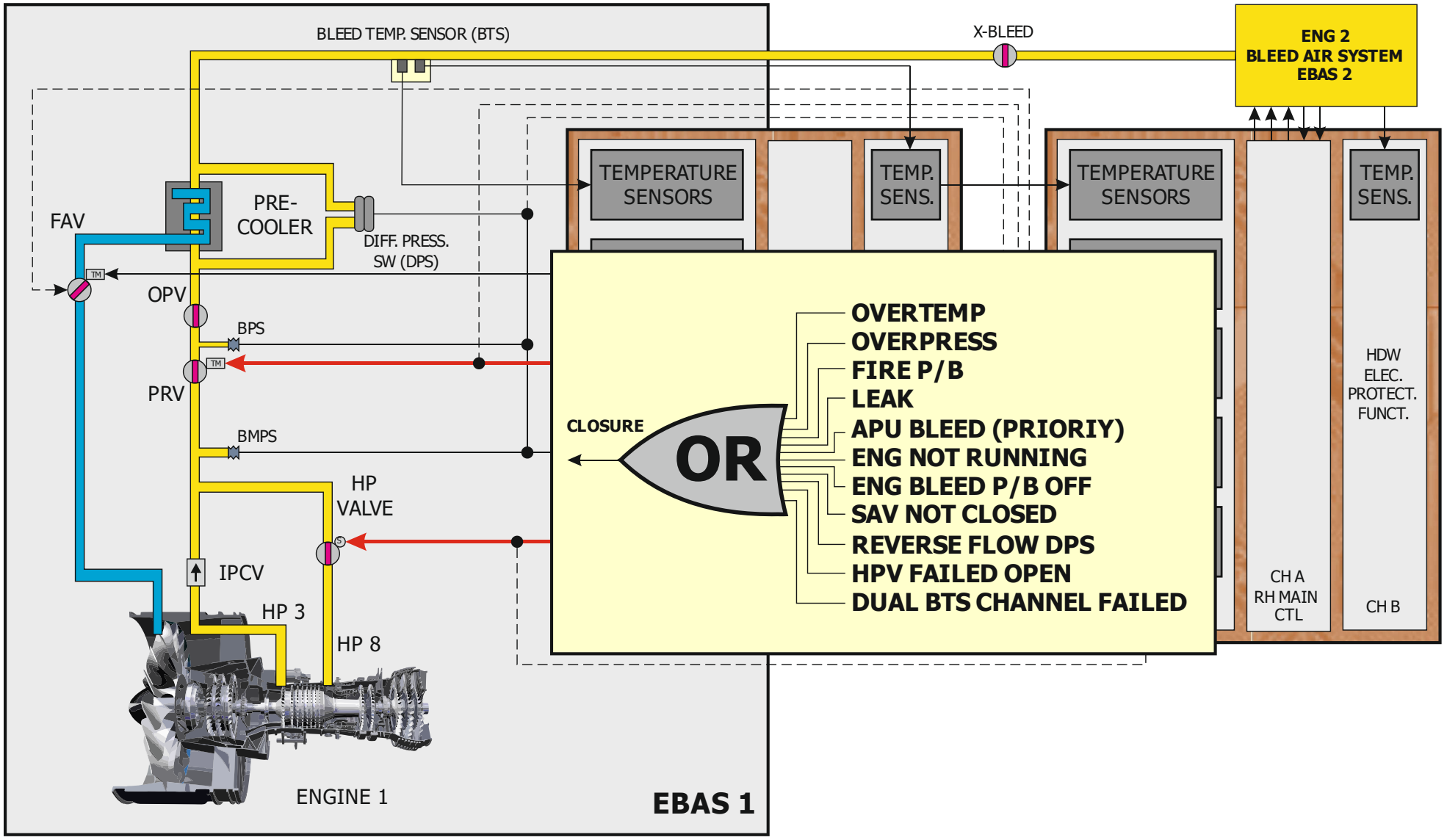
The PRV operates as a shut-off valve. It is commanded to close in the following conditions:

- Over-temperature downstream of the Precooler (BTS): 257°C (495°F) < T 270°C (518°F) during 55s
- 270°C (518°F) < T 290°C (554°F) for 15s, T > 290°C (554°F) for 5s
- Overpressure downstream of the PRV > 60 ± 3 psig at BPS
- Engine fire (consequence of crew action on the ENG FIRE P/B)
- Leak detection in pylon/wing/fuselage ducts surrounding areas

APU bleed valve not closed & APU BLEED P/B selected:

- Depending on the Crossfeed Bleed Valve (CBV) position, only one PRV (left engine PRV if CBV is closed) or both (if X-Bleed is open)
- Reverse flow detected by DPS
- ENG BLEED P/B selected OFF or ENG not running
- Associated Starter Air Valve (SAV) not closed
- HPV failed open
- Dual BTS channels failed

PROTECTION - ISOLATION - PW1100G shown, LEAP-1A Similar



BMC INTERFACES

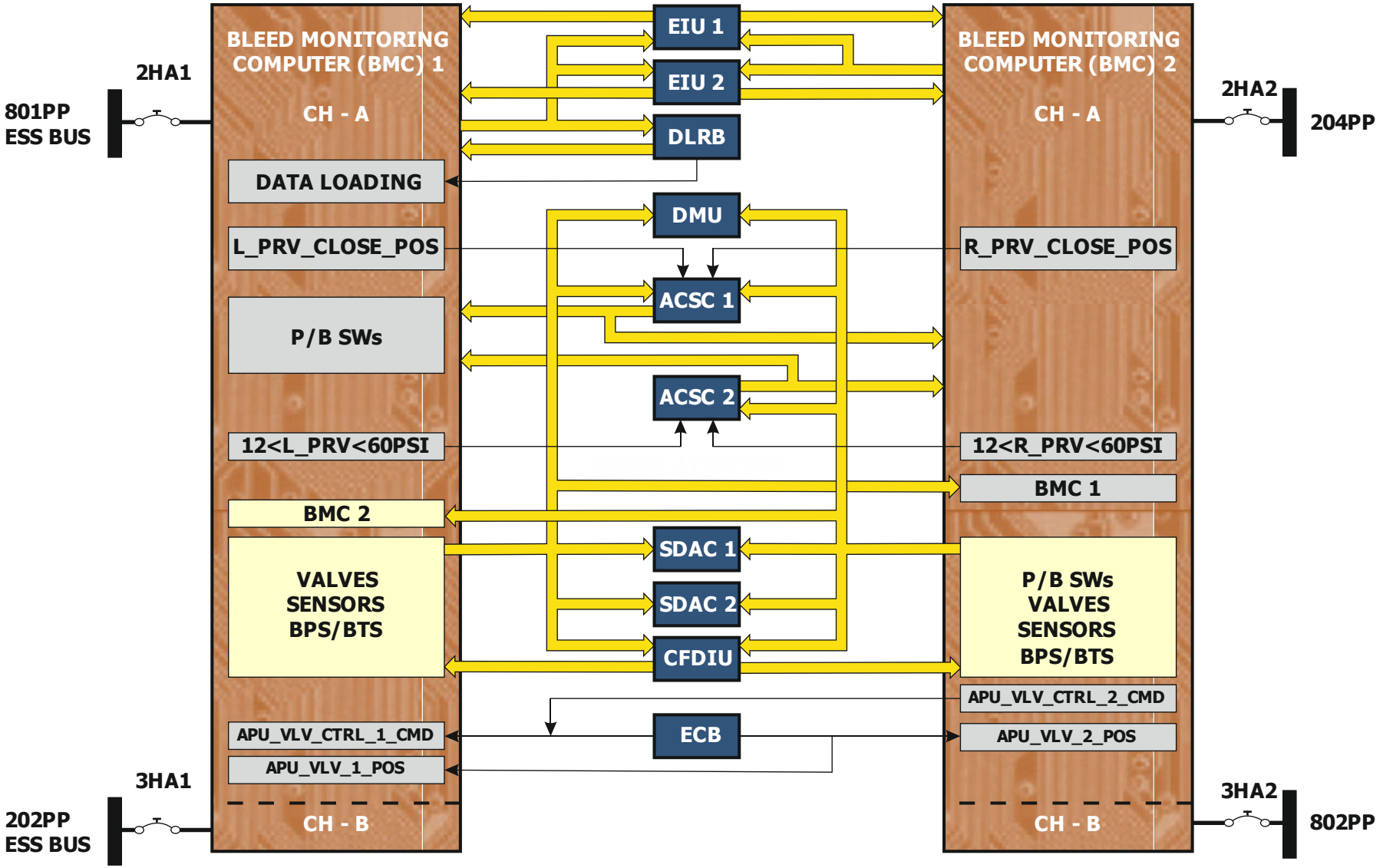
BMC - GENERAL

The pneumatic system uses 2 identical controllers with a microprocessor and command channel A and a back-up channel B. Each channel is supplied by a different 28V DC bus bar.

Both Bleed Monitoring Computers (BMCs) will work as MASTER/SLAVE so long as the ARINC429 cross communication is working properly.

If one ARINC429 bus is lost from one BMC to the other, the BMC receiving no data will take over control and will inform the opposite BMC.

BMC GENERAL


BLEED MONITORING COMPUTER (BMC) 1
CH - A
BLEED MONITORING COMPUTER (BMC) 2
CH - A
2HA1
801PP
ESS BUS
2HA2
204PP
EIU 1
EIU 2
DLRB
DATA LOADING
DMU
L_PRV_CLOSE_POS
R_PRV_CLOSE_POS
ACSC 1
P/B SWs
ACSC 2
12<L_PRV<60PSI
12<R_PRV<60PSI
BMC 1
BMC 2
SDAC 1
VALVES
SENSORS
BPS/BTS
SDAC 2
P/B SWs
VALVES
SENSORS
BPS/BTS
CFDIU
APU_VLV_CTRL_2_CMD
ECB
APU_VLV_CTRL_1_CMD
APU_VLV_2_POS
APU_VLV_1_POS
3HA1
202PP
ESS BUS
CH - B
CH - B
3HA2
802PP

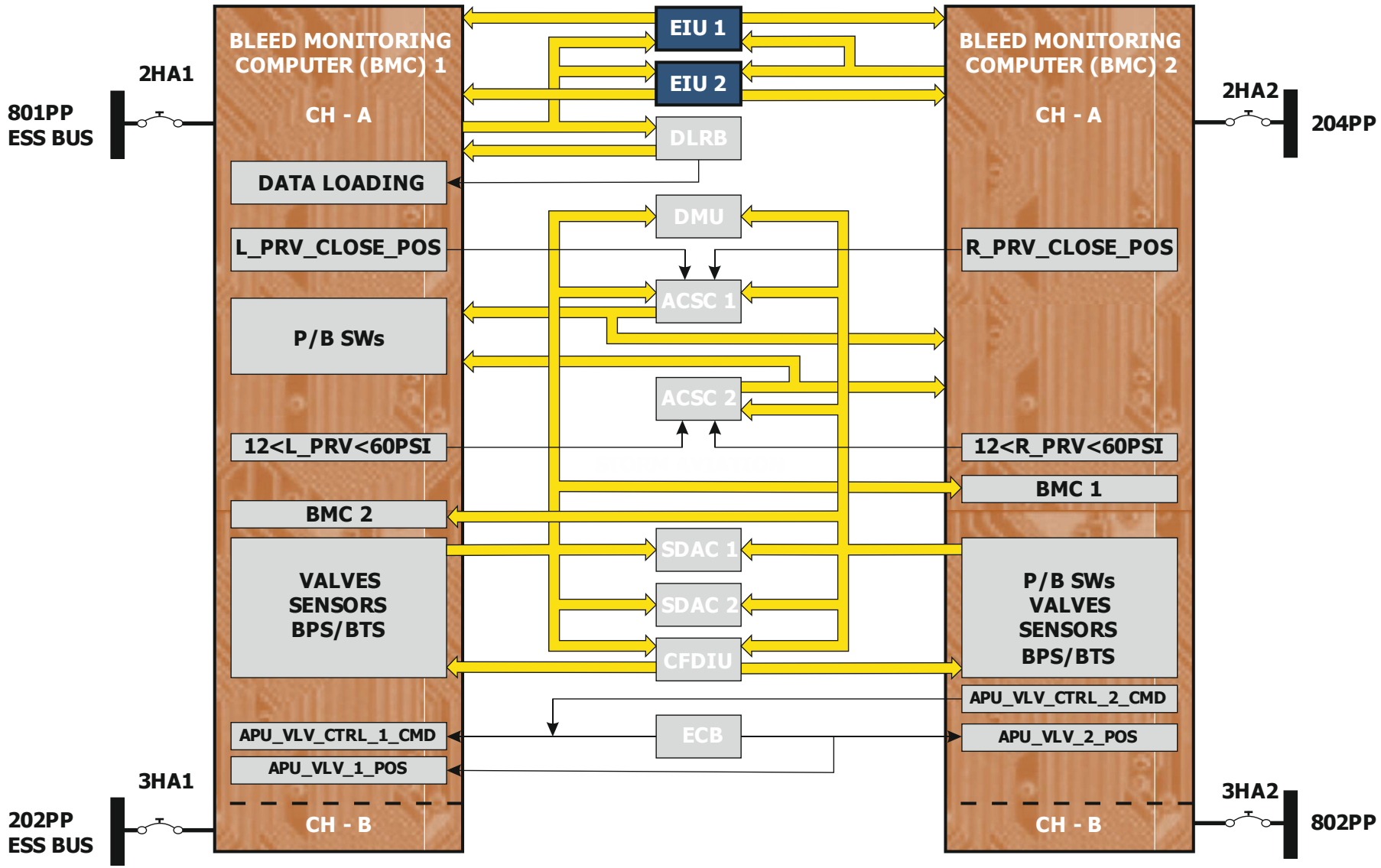
EIU

The Propulsion Control System (PCS) informs both BMCs via both Engine Interface Units (EIUs) when engines start/run.

The Electronic Engine Control (EEC) will need information relative to the Aircraft Environmental Control System (ECS) from the EIU ARINC data bus as system bleed pressure, bleed and anti-ice configuration.

The EIUs receive positions of ENG BLEED P/Bs ON, APU BLEED P/B OFF, and Crossbleed valve status.

BMC - EIU


BLEED MONITORING COMPUTER (BMC) 1
CH - A
BLEED MONITORING COMPUTER (BMC) 2
CH - A
2HA1
801PP
ESS BUS
2HA2
204PP
EIU 1
EIU 2
DLRB
DATA LOADING
DMU
L_PRV_CLOSE_POS
R_PRV_CLOSE_POS
ACSC 1
P/B SWs
ACSC 2
12<L_PRV<60PSI
12<R_PRV<60PSI
BMC 1
BMC 2
SDAC 1
VALVES
SENSORS
BPS/BTS
SDAC 2
P/B SWs
VALVES
SENSORS
BPS/BTS
CFDIU
APU_VLV_CTRL_2_CMD
ECB
APU_VLV_CTRL_1_CMD
APU_VLV_2_POS
APU_VLV_1_POS
3HA1
202PP
ESS BUS
CH - B
3HA2
802PP
CH - B

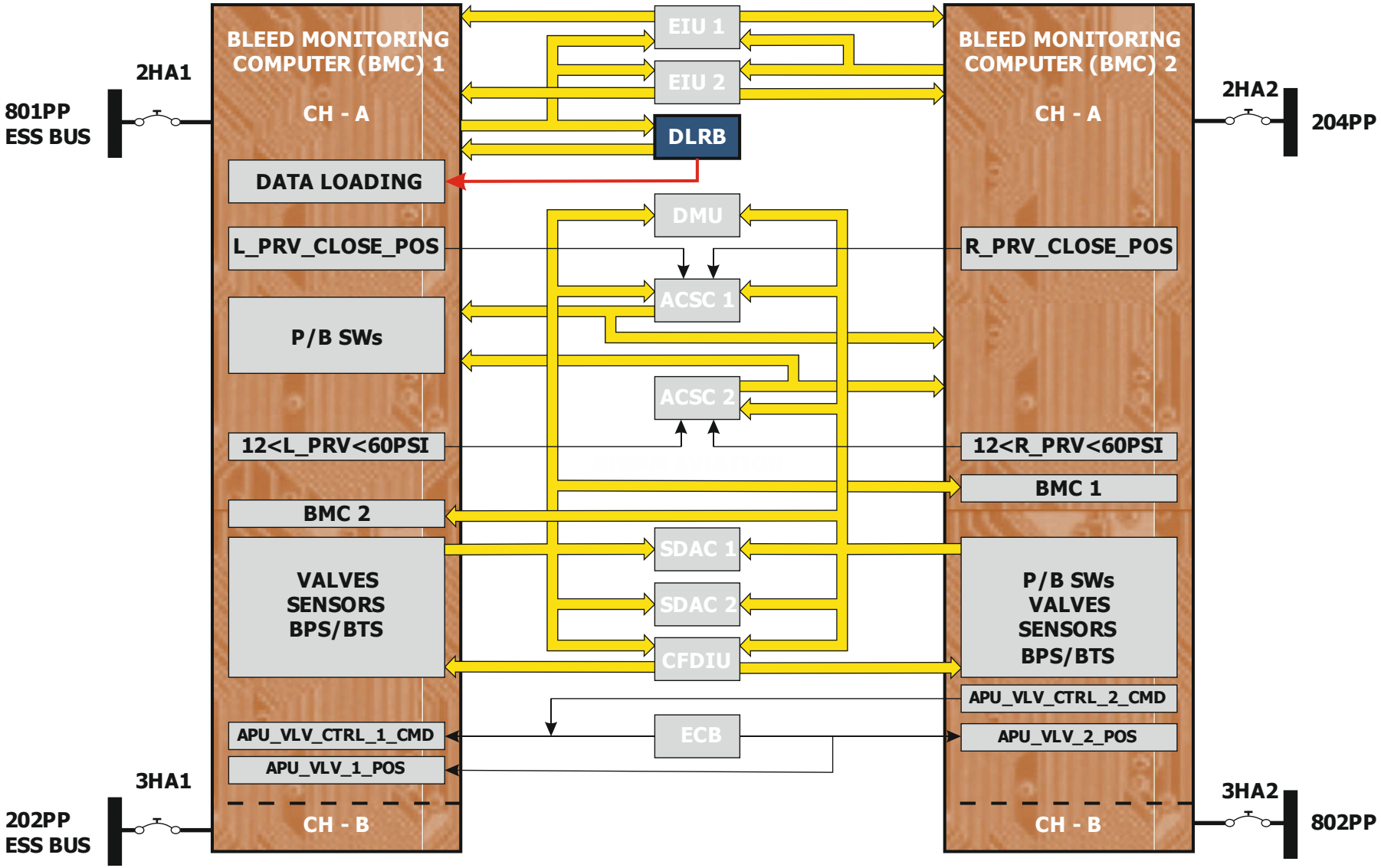
DATA LOADING

The up and down data loading system is an interface between the onboard computers as BMCs and the ground-base data processing stations.

For data loading purposes, the BMC 1Channel A is connected to Data Loading Routing Box (DLRB). The BMC 2 Channel A will be loaded through BMC 1 Channel A.

The two BMCs are uploaded at the same time, BMC1 is directly uploaded through DLRB and BMC2 is uploaded through X-TALK from BMC1. A single selection "BMC selected" is made via the Data Loader Selector (DLS) in the flight compartment.

BMC - DATA LOADING



AIR CONDITIONING SYSTEM CONTROLLER (ACSC)

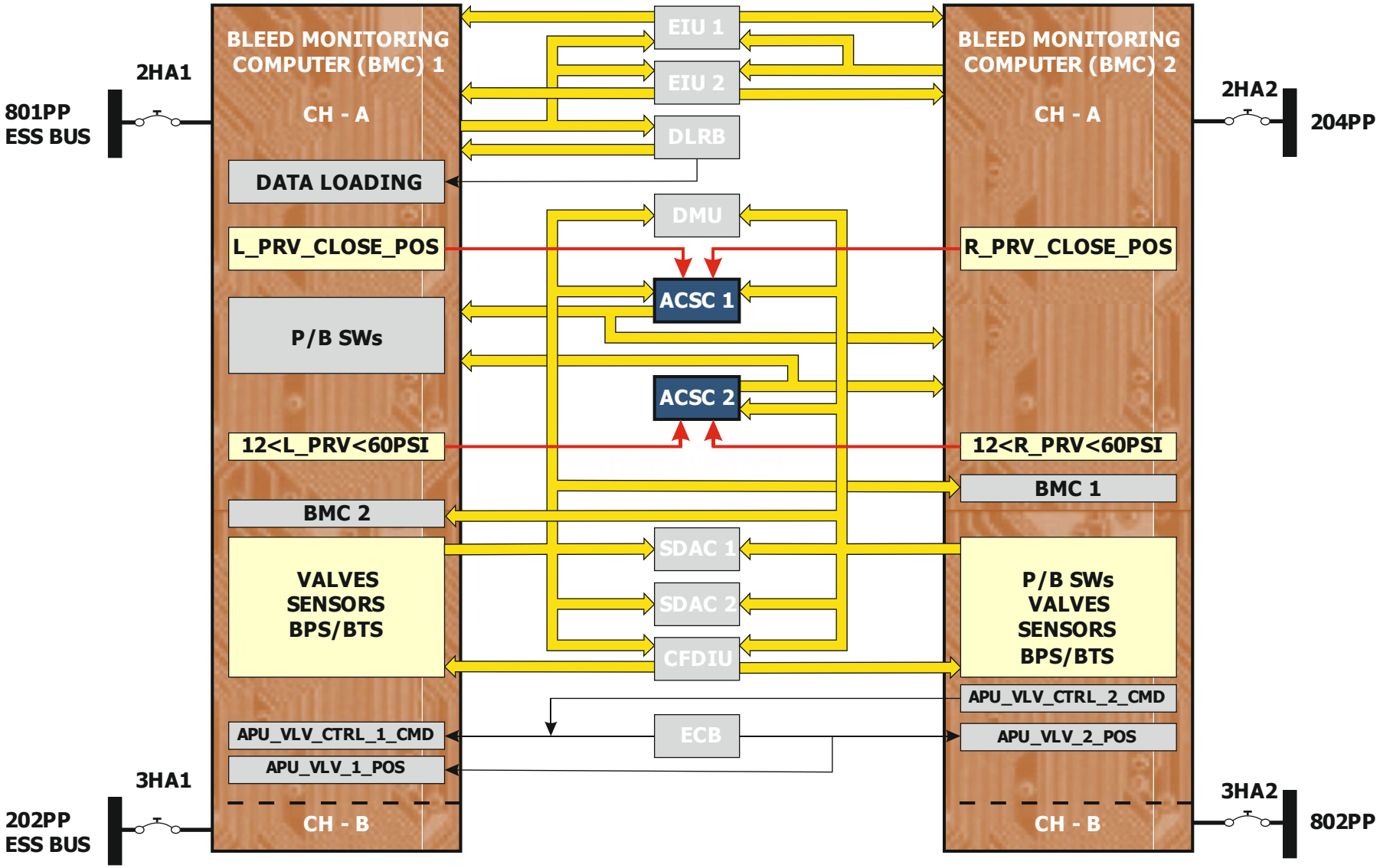
The BMC inform the Air Conditioning System Controller (ACSC) on the precooler outlet temperature for pack flow calculation. The bleed pressure Sensor (BPS) and the wired Crossbleed valve position are used for Pack Inlet Pressure Sensor (PIPS) monitoring.

The BMC send a discrete input of its Pressure Regulating Valve (PRV) position.

Another discrete signal informs about the precooler delivered bleed pressure.

The ACSCs input the BMCs for Pack 1/2 P/B SW position, Pack Inlet Pressure and wing anti-ice valves position.

BMC - AIR CONDITIONING SYSTEM CONTROLLER (ACSC)

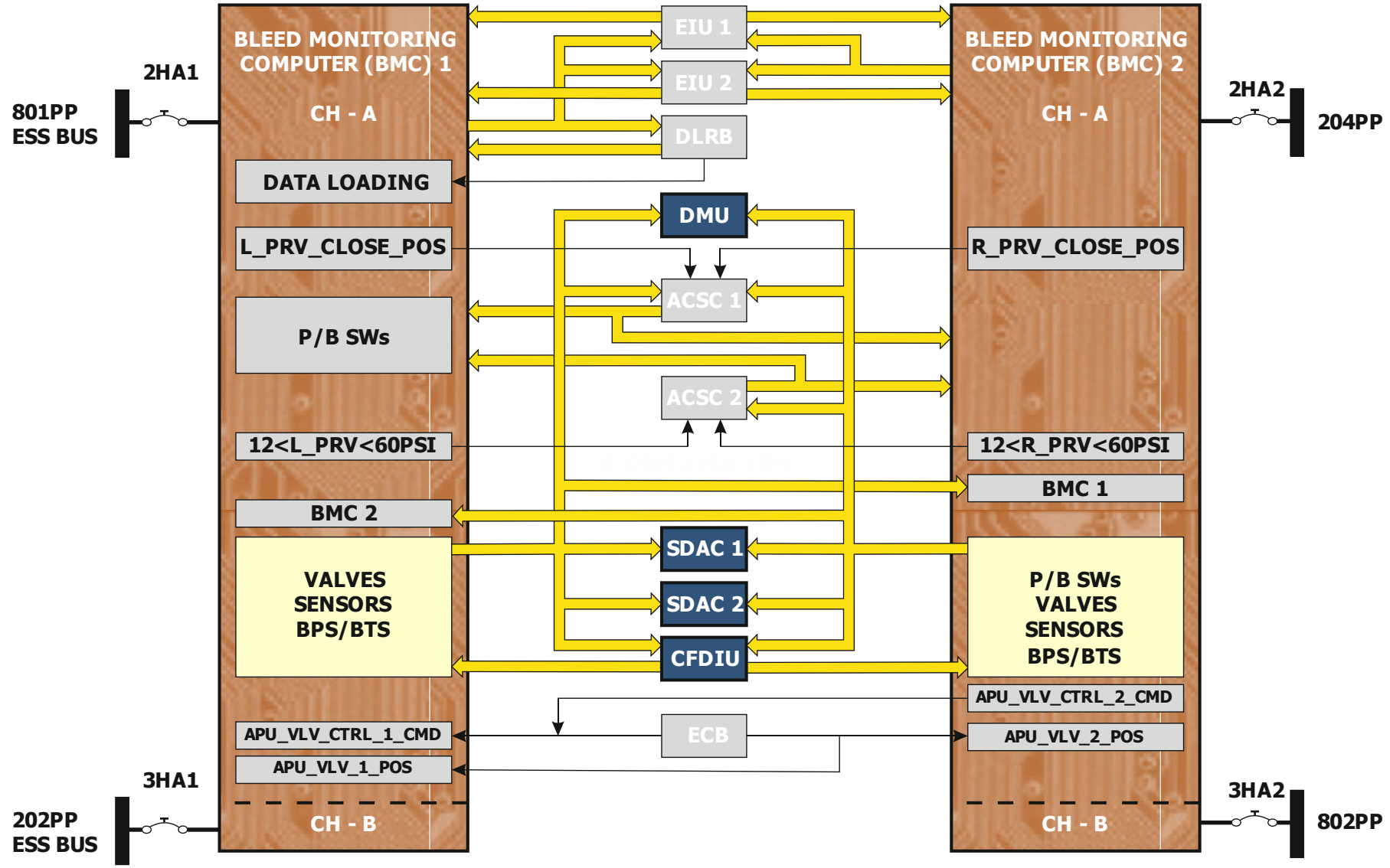


BMC - DISPLAY

The BMCs 1and 2 transmit ARINC signals to the System Data Acquisition Concentrator (SDAC) for monitoring, fault indication, warning and data recording purposes by the Flight Warning Computer (FWC), Electronic Instrument System (EIS) and Digital Flight Data Recording System (DFDRS).

The Centralized Fault Display Interface Unit (CFDIU) is connected to the BITE of the BMCs to centralize the pneumatic system data for maintenance via the Multipurpose Control and Display Units (MCDUs), printer and Aircraft Communication Addressing and Reporting System (ACARS).

BMC - DISPLAY

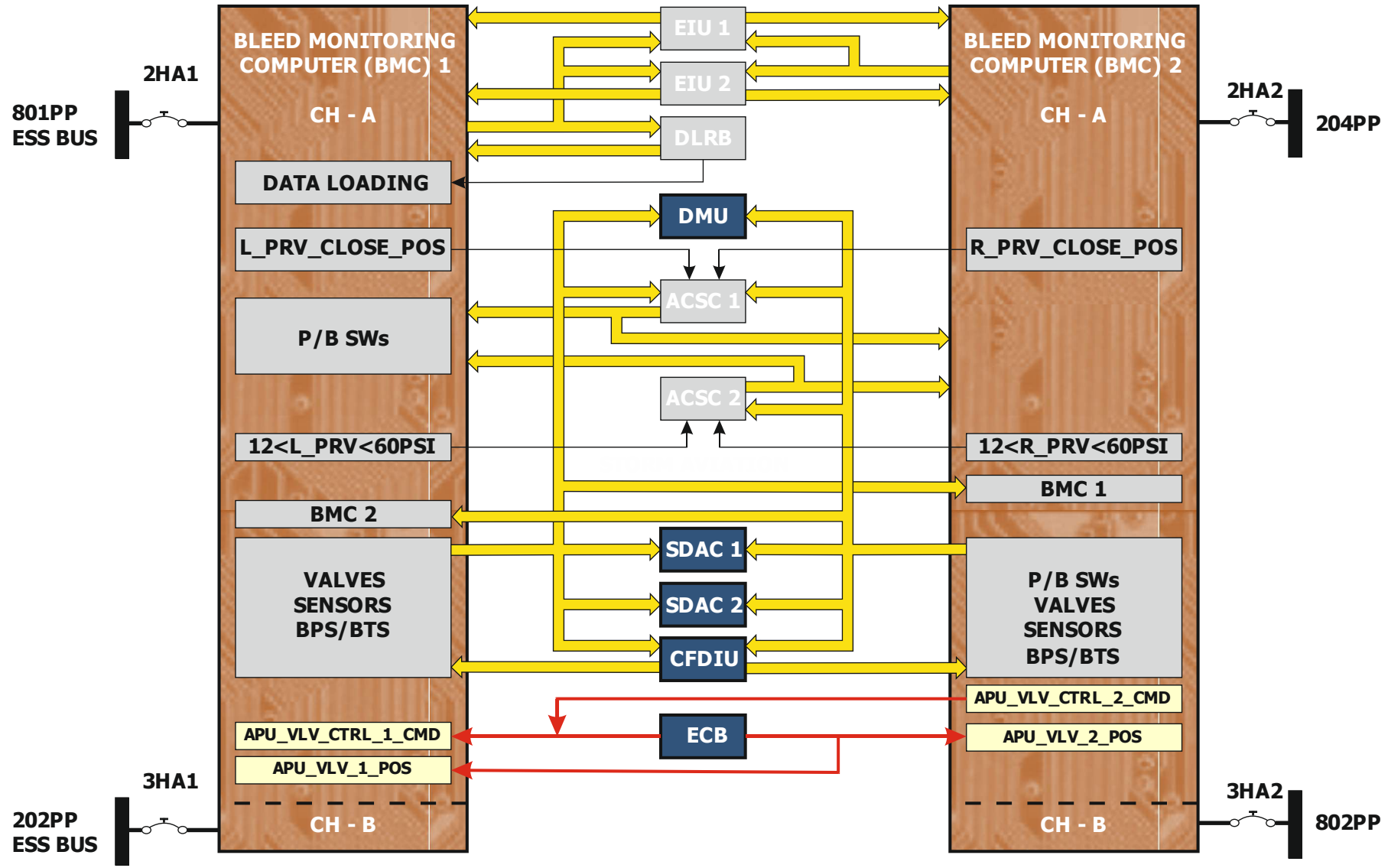

BLEED MONITORING COMPUTER (BMC) 1
CH - A
BLEED MONITORING COMPUTER (BMC) 2
CH - A
2HA1
801PP
ESS BUS
2HA2
204PP
EIU 1
EIU 2
DLRB
DATA LOADING
DMU
L_PRV_CLOSE_POS
R_PRV_CLOSE_POS
ACSC 1
P/B SWs
ACSC 2
12<L_PRV<60PSI
12<R_PRV<60PSI
BMC 1
BMC 2
SDAC 1
VALVES
SENSORS
BPS/BTS
SDAC 2
CFDIU
P/B SWs
VALVES
SENSORS
BPS/BTS
APU_VLV_CTRL_2_CMD
APU_VLV_2_POS
ECB
APU_VLV_CTRL_1_CMD
APU_VLV_1_POS
3HA1
202PP
ESS BUS
CH - B
3HA2
802PP
CH - B

BMC - APU

The APU/Electronic Control Box (ECB) system sends to the Engine Bleed Air System EBAS/BMC the information about APU bleed valve position in order to command the PRV to close when APU BLEED P/B is ON.

The EBAS transmits to the ECB information related to the APU Bleed Valve open Command in order to provide APU Bleed valve control in when APU flow is required.

BMC - APU


BLEED MONITORING COMPUTER (BMC) 1
CH - A
BLEED MONITORING COMPUTER (BMC) 2
CH - A
2HA1
801PP
ESS BUS
2HA2
204PP
EIU 1
EIU 2
DLRB
DATA LOADING
DMU
L_PRV_CLOSE_POS
R_PRV_CLOSE_POS
ACSC 1
P/B SWs
ACSC 2
12<L_PRV<60PSI
12<R_PRV<60PSI
BMC 1
BMC 2
SDAC 1
VALVES
SENSORS
BPS/BTS
SDAC 2
P/B SWs
VALVES
SENSORS
BPS/BTS
CFDIU
APU_VLV_CTRL_2_CMD
ECB
APU_VLV_CTRL_1_CMD
APU_VLV_2_POS
APU_VLV_1_POS
3HA1
202PP
ESS BUS
CH - B
3HA2
802PP
CH - B

PNEUMATIC LEAK DETECTION SYSTEM - Level 3

LEAK DETECTION

Leak detection loops are installed along the hot air supply ducts of the pneumatic system. The loops are made of multiple sensing elements connected in series to the BMCs Overheat Detection System (OHDS).

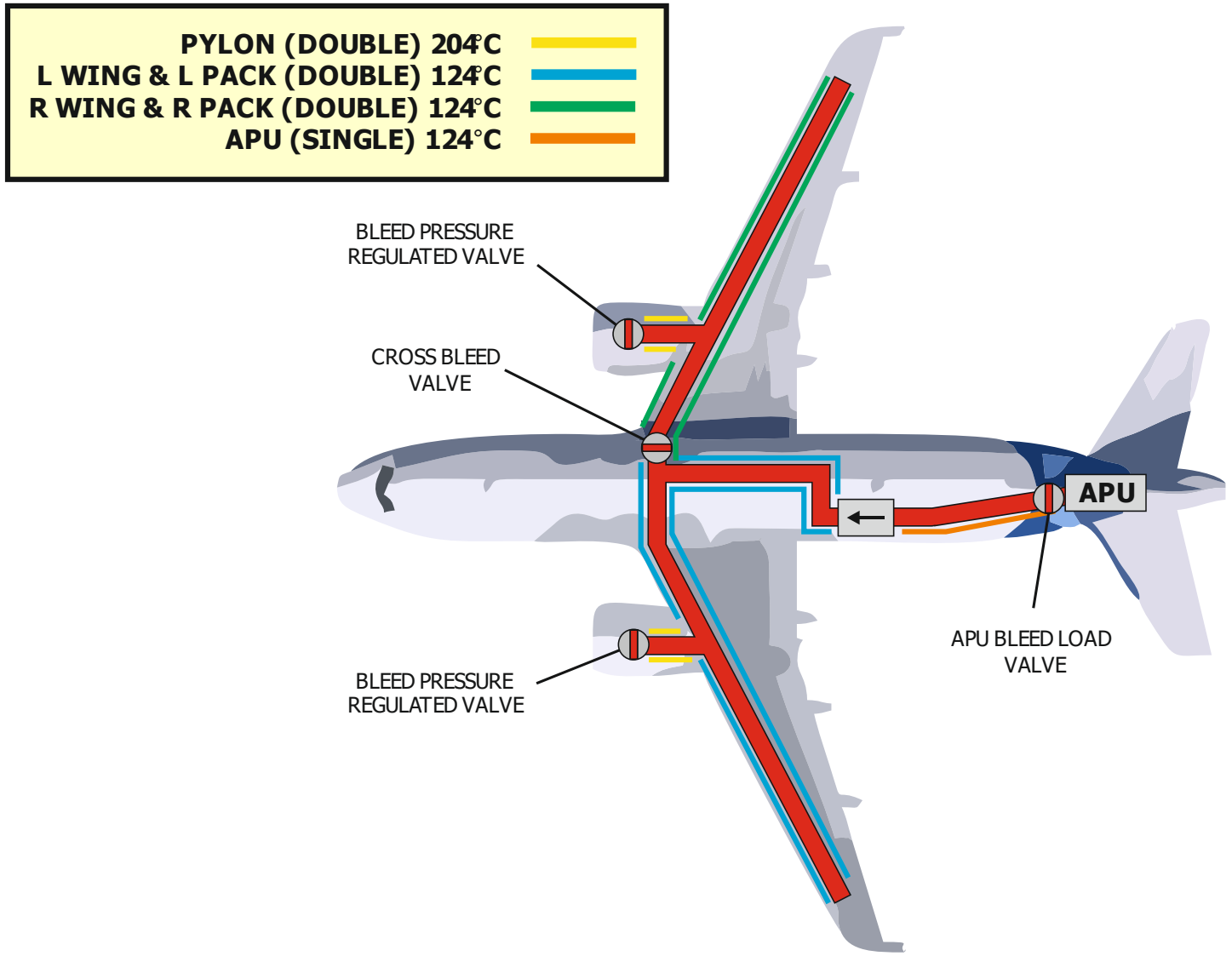
If a leak is detected, a signal is sent to the BMC 1or 2 which automatically isolates the affected area by closing the crossbleed valve and shutting off the engine bleed on the affected side.

The leak detection system is organized into three loops.

Here are the loops and the protected areas:

- Pylon: dual loop from the precooler to the wing leading edge
- Wing: dual loop from wing leading edge, including the wing air inlet supply, and belly fairing (cross bleed duct, pack supply ducts and APU forward supply duct)
- APU: single loop at APU aft supply duct (left hand side of the fuselage) from APU firewall to wheel well area

LEAK DETECTION - ROUTING



DETECTION LOGIC

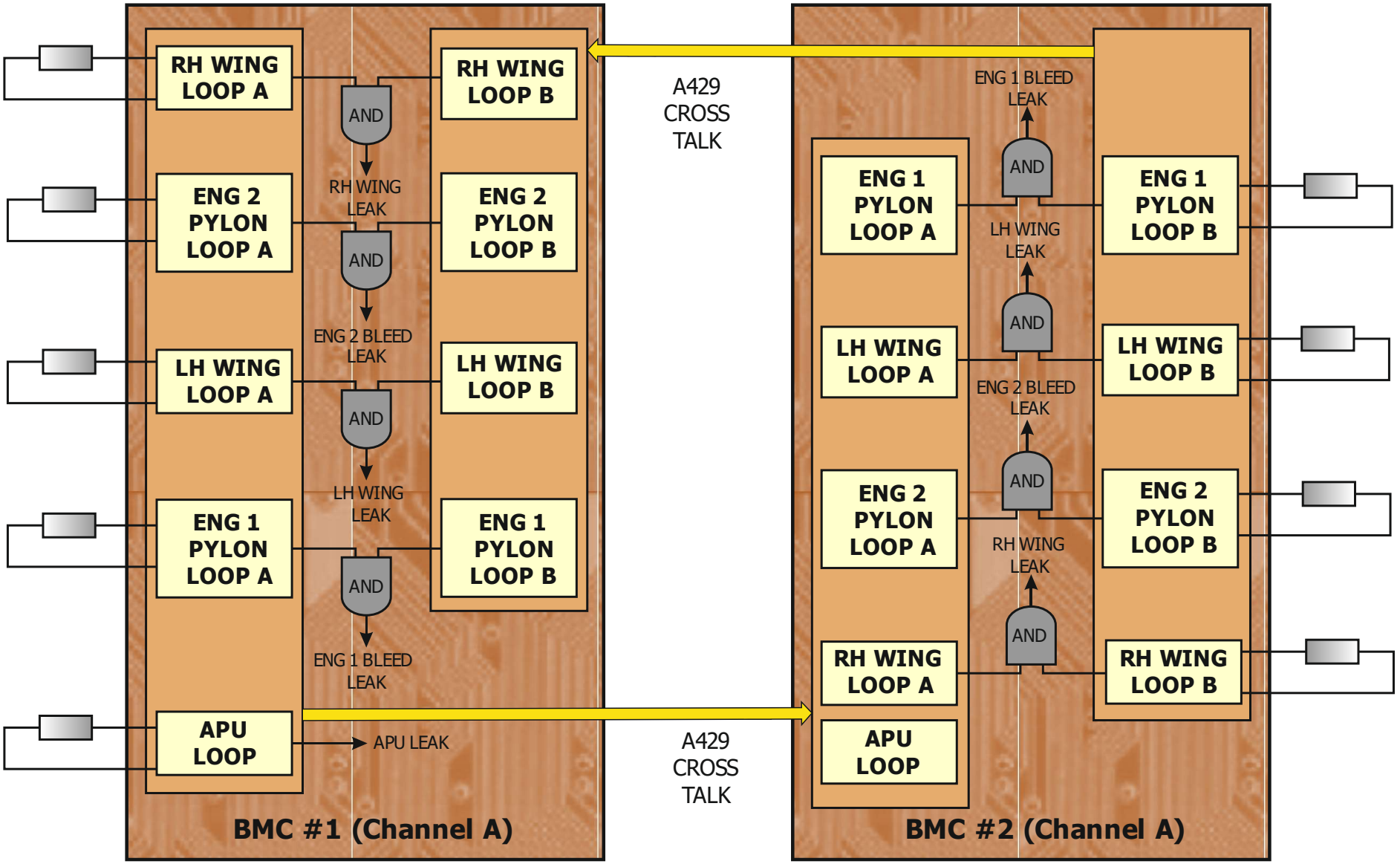
Both Bleed Monitoring Computers (BMCs) permanently receive signals from the leak detection loops primarily tested at power-up.

They exchange data via an ARINC bus for the double loop detection. Each BMC channel A normally controls its side engine bleed air system, so monitors the Over Heat Detection System (OHDS).

Note: The wing and pylon loops A are connected to one BMC and wing and pylon loops B to the other BMC.

The crosstalk bus allows wing leak warnings to be activated through an AND logic. The APU loop is connected to BMC 1 only.

BLEED LOOP DETECTION LOGIC



WARNING CONSEQUENCES

The ENG BLEED FAULT light comes on when a leak is detected by the wing loops A and B or by the pylon loops A and B. The APU BLEED FAULT light comes on when an APU duct leak is detected.

When an overheat condition is detected by both loops, the following alerts are generated for the affected zone:

- AIR ENG 1(2) LEAK for a leak/overheat detected in the Pylons
- AIR L(R) WING LEAK for a leak/overheat detected in the Wings
- AIR APU LEAK for a leak/overheat detected in the APU line
- AIR APU LEAK [APU LEAK FED BY ENG] for a leak/overheat detected in the APU line and the leak is automatically isolated

A new warning alert has been introduced on the A320neo, the AIR BLEED LEAK to isolate a bleed leak in the opposite pylon to the operative bleed with manually open Crossbleed Valve.

The failure of a single loop for Pylon or Wing is identified by a **MAINTENANCE** status message displayed on the STATUS SD page.

Dual engine loop failure is identified by the **AIR ENG 1(2) LEAK DET FAULT** and is NO GO.

If one BMC is failed, the other BMC takes over monitoring of the bleed system and triggers the ECAM warnings.

The aircraft dispatch is for 10 days with the BMC 1inoperative for non-ETOPS operations provided that the Engine 1Bleed Air System (EBAS 1) is considered inoperative and the APU leak detection loop is considered inoperative.

LEAK CONSEQUENCE

A detected leak will close associated valves, as shown on the table. These valves are automatically controlled to close if they were open.

Note: APU and cross bleed (X-BLEED) valves do not close during Main Engine Start (MES).

WARNING & LEAK CONSEQUENCES

TYPE OF FAILURE	ENG 1 FAULT (PYLON LEAK OR LH WING LEAK)	ENG 2 FAULT (PYLON LEAK OR RH WING LEAK)	APU LEAK (EXCEPT DURING ENGINE START)
AUTO RESPONSE/ **VALVE CLOSURE**	• PRV 1 • ANTI-ICE VALVE 1 • X-BLEED VALVE (WHEN IN AUTO) • APU BLEED VALVE	• PRV 2 • ANTI-ICE VALVE 2 • X-BLEED VALVE (IN AUTO)	• APU BLEED VALVE • X-BLEED VALVE (IN AUTO)

MEL ITEMS

EBAS MEL

The aircraft dispatch is for 10 days with the Engine Bleed Supply System inoperative on one side provided that:

The associated bleed is isolated by setting the ENG BLEED P/BSW to OFF,

The X-BLEED valve is manually open to supply both sides,

The speed brakes are operative.

For an Extended Range Twin Engined Aircraft Operations (ETOPS) flight, Auxiliary Power Unit (APU) Bleed should be available.

One Engine Bleed Air System (EBAS) remaining available, it supplies both sides for Wing Anti-Ice (WAI) and air conditioning.

However, there is limitation on A320 neo compared to A320 ceo due to lower capacity of the heat exchanger in case of single bleed operations.

Note: Only one PACK can be supplied. Therefore, the associated operational procedure will ask to switch one PACK off.

HPV FAILURE

Failed closed High Pressure Valve (HPV) can lead to low bleed pressure or low bleed temperature when engine is at low power settings (in idle or in holding conditions).

HPV failed in open position, leads to Bleed overpressure or Bleed over temperature identified by **AIR ENG 1(2) BLEED FAULT.**

In case of failure of one HPV, the aircraft can be dispatched for 10 days with the valve secured closed.

The consequence of having the HPV secured closed is that the bleed air from the Intermediate Pressure (IP) port will be insufficient at low engine power settings (taxi, descent, holding). That is the reason why the crew procedure requests to switch off the associated EBAS at low power setting and to open the Crossbleed valve in order to supply both sides from opposite EBAS which is operative.

INTENTIONALLY LEFT BLANK

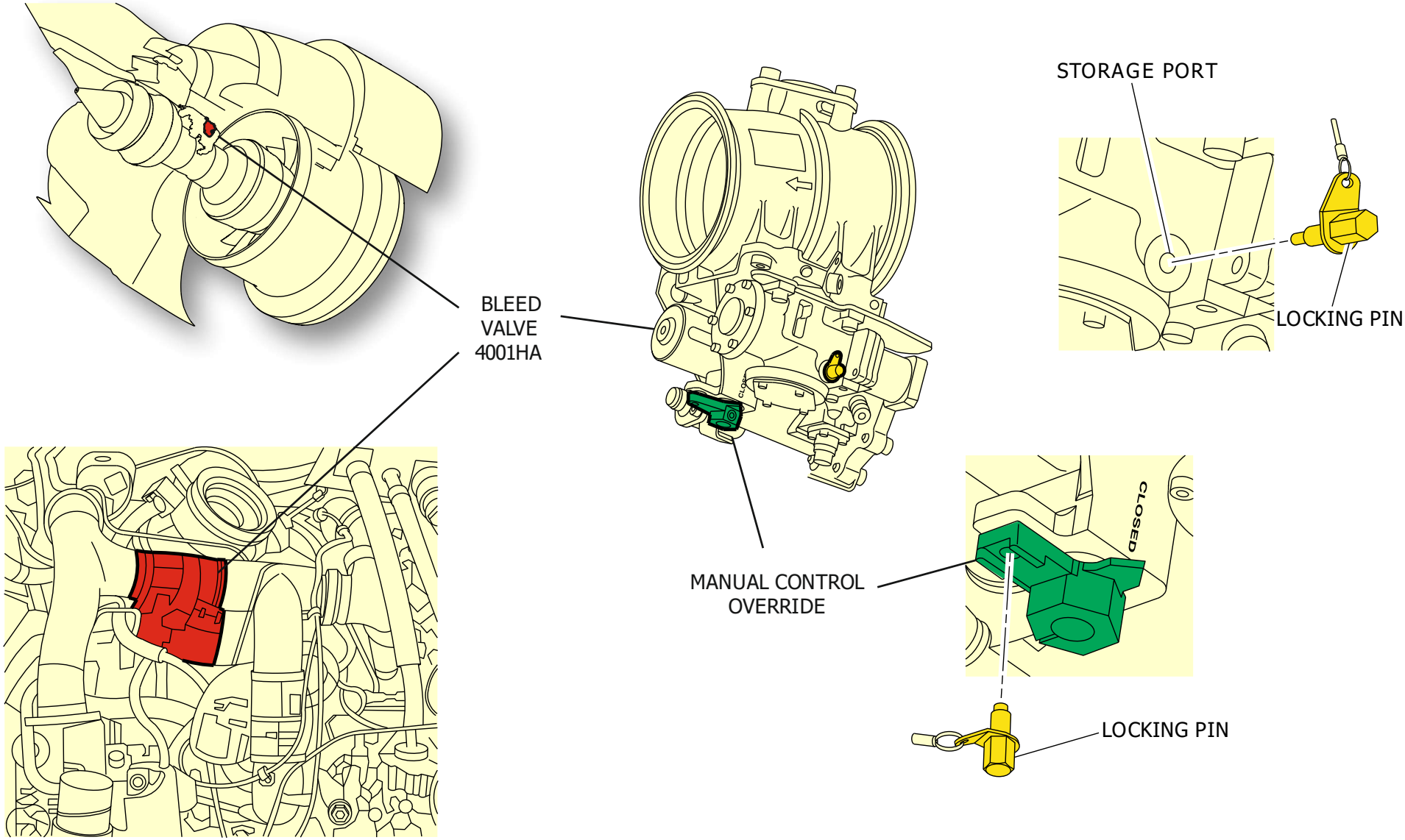
BLEED VALVES DEACTIVATION

In case of failure, Bleed Valve (FIN 4001HA) and High Pressure Regulator Valve (PRV) (FIN 4000HA) have to be deactivated CLOSED for dispatch under Minimum Equipment List (MEL).

The deactivation procedure is the same for both valves:

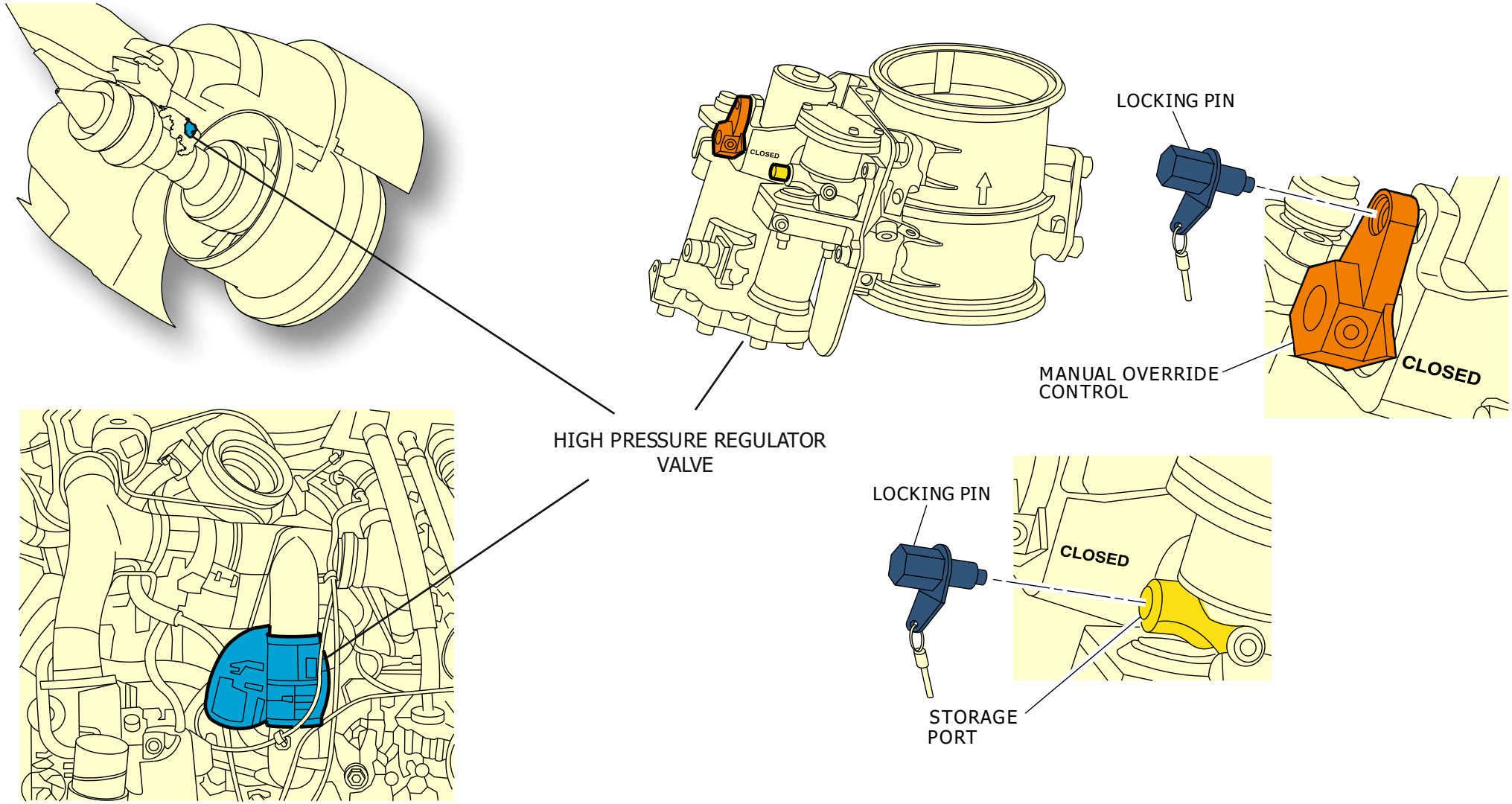
1. Make sure pneumatic system in not pressurized, BLEED switches OFF
2. Deactivate the thrust reverser
3. Open the RH fan and reverser cowls
4. Move the manual override to the CLOSED position
5. Secure in CLOSED position with locking pin
6. Close cowlings
7. Reactivate the thrust reverser

BLEED VALVE DEACTIVATION -4001HA - PW1100G shown, LEAP-1A Similar



INTENTIONALLY LEFT BLANK

HIGH PRESSURE BLEED VALVE DEACTIVATION - 4000HA - PW1100G shown, LEAP-1A Similar



MEL ITEMS (continued)

WING LEAK DETECTION

The WING leak detection is a dual-loop system. To generate a WING LEAK warning, both A and B loops have to detect the overheat. For dispatch, WING leak detection must be operational (at least one loop) on each wing. If a single loop fails, the MAINTENANCE message AIR BLEED will be displayed on the STATIJS page associated with a Centralized Fault Display System (CFDS) message L(R) WING LOOP (INOP). The aircraft may be dispatched per MEL with the MAINTENANCE message displayed.

For troubleshooting it is important to understand that the WING detection elements monitor much more than just the wings alone. The protected areas are:

- Wing leading edge (wing anti-ice supply duct)
- Air conditioning compartment - belly fairing - (pack supply, crossbleed manifold, APU supply, ground air supply)
- APU forward supply duct (from the APU check valve through the wheel well)

MAINTENANCE TIPS

CFDS

CFDS menus for all failure reports and interactive mode displays are generated by the Bleed Monitoring Computer (BMC) itself.

In normal mode, the BITE transmits maintenance messages (Standard A type 1) for detection results on level of:

- Over Heat Detection System (OHDS), Valves, Precooler
- Sensors
- External communication
- Internal communication
- BMC (Hardware and Software)

The electrical test verifies the EBAS following functions:

- Central Processing Unit (CPU) (microprocessor, RAM, ROM)
- discrete outputs
- leak detection loops and interfaces
- discrete and analogue inputs
- digital Inputs/Outputs
- torque motors, solenoid
- pressure sensors failures
- temperature sensors failure
- valves

The pressure sensor drift test shall detect any pressure drift in Differential Pressure Sensor (DPS) and/or Bleed Pressure Sensor (BPS).

Electrical Protection System (EPS) corresponds to the channel B Electrical Protection Function (EPF) test.

The reports menu displays the status in real time for all the system.

INTENTIONALLY LEFT BLANK